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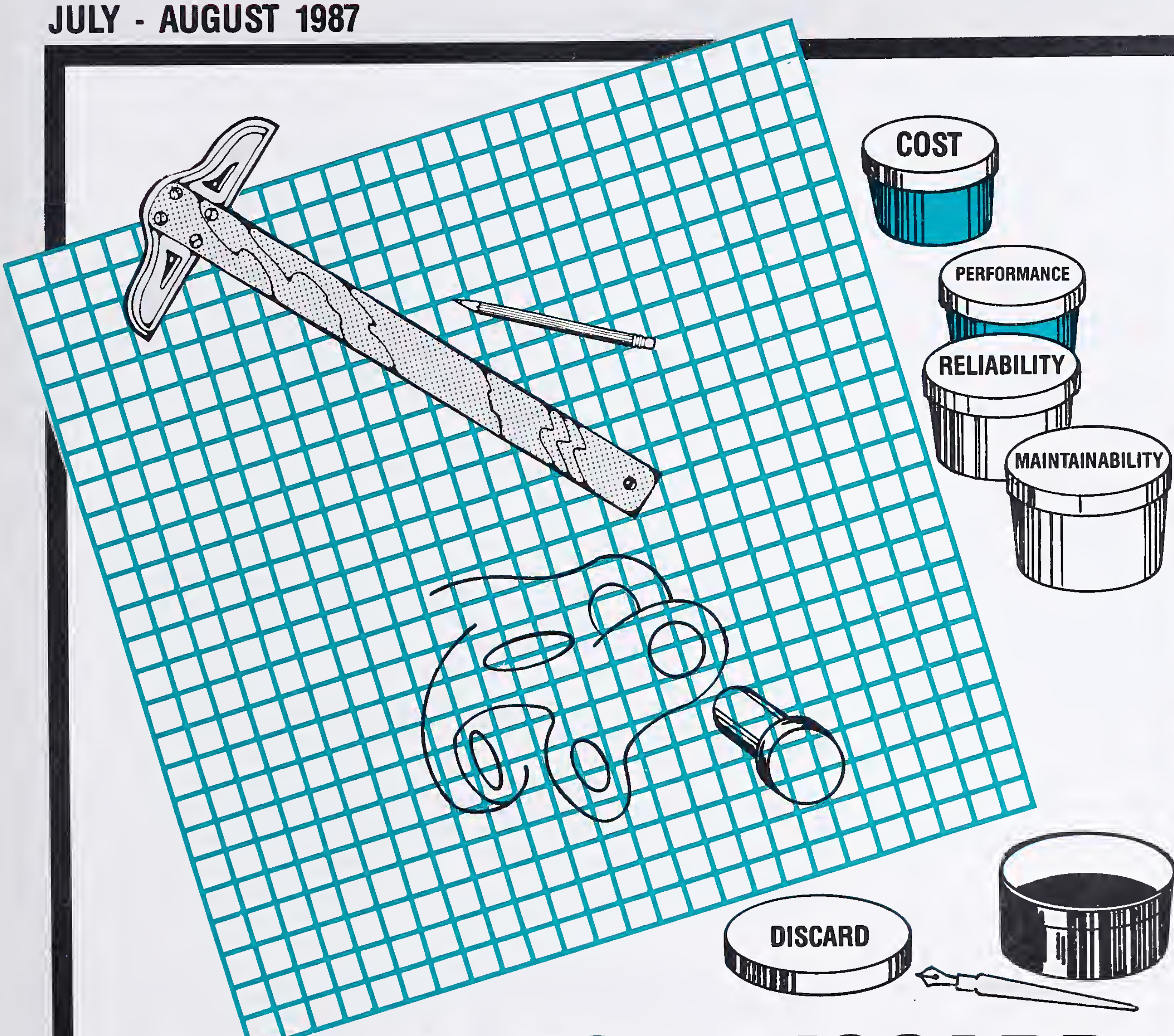
JULY - AUGUST 1987



DESIGN FOR DISCARD

ARMY
Research
Development
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RD&A

PB 70-87-2 JULY-AUGUST 1987

PROFESSIONAL BULLETIN OF THE RDA COMMUNITY

This medium is approved for the official dissemination of material designed to keep individuals within the Army knowledgeable of current and emerging developments within their areas of expertise for the purpose of enhancing their professional development.

By order of the Secretary of the Army:

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General, United States Army Chief of Staff

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FEATURES

DEPARTMENTS

ABOUT THE COVER

The front cover relates to the design-for-discard engineering effort aimed at eliminating or reducing materiel maintenance tasks. The back cover is associated with a feature story on reverse osmosis water purification equipment. Cover designed by Carolyn Zakaski, AMC Graphics Section.

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Design-for-Discard

By COL William V. Murry

Introduction

Design-for-Discard (DFD) in lieu of repair is aimed at improving readiness by the reduction of the Army's "tail-to-tooth" ratio. The gains that can be achieved by DFD alone are small as compared to the gains achievable through restructuring The Army Maintenance System (TAMS) with DFD as the central theme. Design-for-Discard is just the "tip of the iceberg" which is the totality of TAMS.

This article seeks only to establish the need for implementing a DFD maintenance and supply concept, and to introduce the engineering basics that will pave the way. Reorganization and restructuring TAMS are not an instant purpose.

What Is It?

Design-for-Discard is a not-so-new, new Army Materiel Command (AMC) initiative. Former AMC Commander GEN Richard H. Thompson first introduced the concept in his "Maintenance State of the Union" letter in September 1982, when he was the DA DCSLOG. When he first came to AMC as commander he re-emphasized the concept and sent a command letter to all major subordinate commands and separate reporting PMs in March 1986 stating that the "top design priority for modules and assemblies is Design-for-Discard in lieu of repair."

By August of 1986, little accountable progress had been made to implement DFD. At that time, the lead responsibility for getting this initiative off the ground was assigned to the HQ AMC deputy chief of staff for development, engineering, and acquisition.

Design-for-Discard is a positive and proactive system engineering effort directed at the elimination, or at least reduction, of the materiel maintenance effort required to support the total Army force. As a system engineering initiative, it will result in organizational and procedural engineering as well as hardware and software engineering.

The DFD hypothesis says that the cost benefit of not maintaining a repair capability and of converting logistics "tail" to combat "teeth" will exceed the apparent waste of discarding seemingly expensive components or assemblies. Support for this hypothesis comes from the observations of corporate maintenance practices mentioned below. Given the mobilization demands on Army forces subject to a fixed military manpower ceiling, the hypothesis makes sense from a readiness point of view. As with any hypothesis, proving it right is not possible. However, proof is not necessary; implementation for any given system, assembly, or component must be based on a readiness affordability decision as much as on economic analysis.

Design-for-Discard in lieu of repair represents a significant departure from the in-place maintenance and supply structure in the Army. The in-place structure is based largely on peacetime economic analysis that has little to do with the maintenance of combat power in wartime. Some consideration is given to what needs to be done to keep war machinery going in combat. But, the Army's experience in and capability to model the extremely rapid pace combat that is visualized for the future is questionable.

Time and security for battlefield maintenance may be totally lacking, and time for retrograde and off-battlefield repair may be greater than the time to manufacture and replace. The Army maintenance process should be designed for this high intensity combat. In lower intensity and localized conflicts, retrograde and contract repair out-of-theater may be possible.

Why DFD?

Before all maintenance officers and "loggies" brand Design-For-Discard as the heretical ramblings of an obvious mental midget afflicted by overexposure to nuclear radiation, hear out the argument. How long has it been since you had a food processor repaired? What did the "repairman" do when you last had your word processor repaired? What were your alternatives the last time you took your automobile in for maintenance that could not be done by the local tune-up shop, or the drive-thru, quickie lube specialist shop? The bottom line is that the commercial sector is turning to DFD because of the high cost of skilled labor as compared to the cost of assembling parts on an automated or unskilled production line.

Many commercial end-items are cheaper to replace than to repair. Many more can be replaced more conveniently than they can be repaired, and at a cost that is not much more than the repair cost. Even large, expensive items such as automobiles and major appliances are usually maintained by identifying and replacing a faulty module instead of fault isolation and repair. Even when the cost of repair to the customer would be less, the time to replace a component for the shop is much less, resulting in a greater profit margin.

Diagnostics often depend more on logic than on technology understanding. Maintenance labor skills are less important. The American economy will always be a place where the individual entrepreneur can make a living from a small company or ma-and-pa shop that specializes in fix-it services. However, the economics of labor costs are driving the major manufacturers and fleet equipment operators to DFD in lieu of repair.

What does the commercial sector

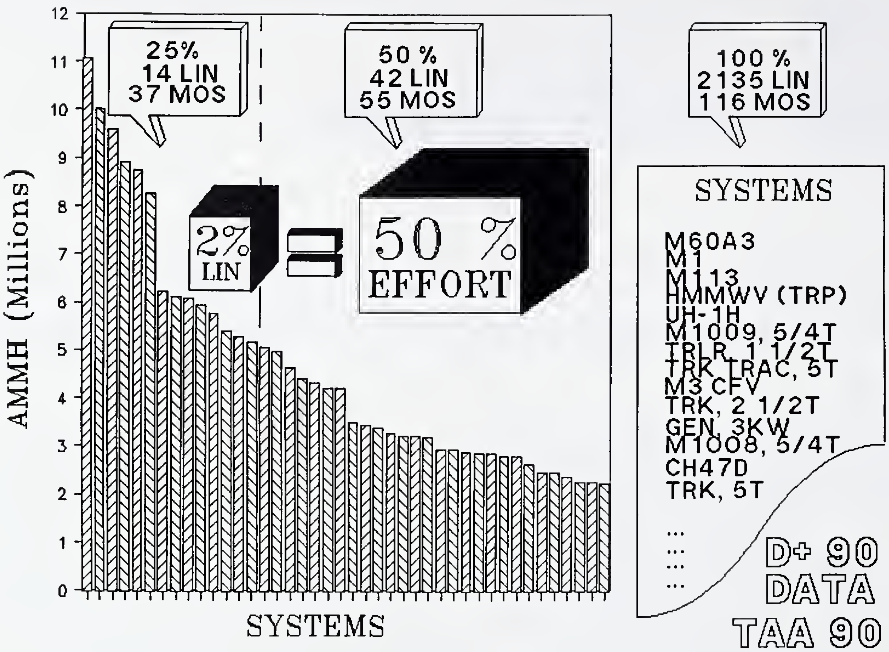

Figure 1

know that the Army does not? Or, conversely, what does the Army know that they do not? The answer is "NOTHING!" Profit in the commercial sector and readiness in the military are both measures of the organization's productive efficiency. The principal ingredients of readiness are manpower, training and operational availability of equipment.

DFD argues that the manpower and training devoted to maintenance and supply do not do all that needs be done to guarantee the operational availability of complex modern equipment in rapid modern combat. Under a DFD concept, operational availability would be restored by replacing modules, assemblies, or even end-items. This requires less skill, hence training, and releases manpower from maintenance and supply chores for use as combat forces.

Where Are We?

According to Total Army Analysis-1990 (TAA 90) data for D + 90, in the current maintenance system, half the Army's annual maintenance man-hour effort employing about half the different maintenance military occupation specialities will be needed to maintain only two percent of the Army's materiel line item numbers (LIN) (see Fig. 1). With a view to streamlining the maintenance workload, the Army is undergoing a two phase TAMS realignment on all the non-aviation LIN in that high two percent. (Aviation LIN were realigned to basically a two-level maintenance system in 1980.) To date, more than 700 components were reclassified from repairable to discardable, and another 700-plus maintenance allocation chart changes (usually to a higher echelon) were made. However, all changes to discard were made because it was economical to do so, not because the component in question was initially and intentionally designed, or subsequently re-designed, to not be repaired.

The staff assessment of AMC progress in implementing DFD is that the major subordinate commands have fallen short in the application and solicitation of system engineering with the object of component, assembly, or end-item discard. Part of the reason for the shortfall in progress is a failure by the HQ staff to articulate and manage DFD objectives and "how-to." Another part of the reason for the shortfall in progress is a mindset that stems from American values typified by the Shaker saying "Use it up; wear it out; make do; or do without."

How to DFD

Design-for-Discard lies in the domain represented by the overlap of manpower and personnel integration (MANPRINT), design to cost (DTC), and integrated logistic support (ILS). DFD provides positive support for MANPRINT objectives by seeking to reduce the manpower, and training required to maintain readiness. Logistics Support Analysis must be ac-

Two Principal DFD Design Approaches

DESIGN IT WITH HIGHER RELIABILITY
(so it will not require replacement as frequently)

High Reliability Piece Parts
Environmental Stress Screening (ESS)
Parallel Redundant Functions
Cocooning

DESIGN IT TO COST LESS
(so frequent replacement is more economical)

Non–Developmental Items
Commercial Components
Modular Packaging
Producibility Engineering

Figure 2

complished early in system concept formulation and requirements definition to set specific system DFD goals and objectives. These goals and objectives must then be reflected in the system Operational and Organizational (O&O) Plan, system Acquisition Strategy, and program Request for Proposals.

Logistics Support Analysis in support of ILS policies is specified in MIL-STD-1388-1A. Task 303.2.7, Level of Repair Analysis (LORA), is the specific task in which repair vs. discard decisions are made. Usually, LORA assumes the current maintenance structure, and a decision to discard is based on resulting economics without any positive or proactive system engineering attempt to redesign specifically for discard. Initial design partitioning efforts that yield a repair decision in task 303.2.7 LORA must be modified to favor discard and then reiterated, in turn, through tasks 203, 301 and 302.

Design-for-Discard engineering must be applied to components, line replaceable units, shop replaceable units, assemblies, subsystems, and when possible, end items. DFD will be achieved primarily by two systems engineering approaches (see Fig. 2).

- First, design to be more reliable, thereby reducing the frequency at which the item must be replaced. Typical examples are to use high reliability piece parts, parts that have undergone environmental stress screening, parallel redundant parts to increase functional reliability, and "cocooning" of parts for protection.

- Second, design to be lower cost, thereby reducing the cost of frequent replacement. Typical examples are to use nondevelopmental end items, lower cost commercial components, modular packaging of parts with similar failure and cost characteristics, and to base design on production processes.

Several of the examples bear further elaboration and discussion:

- *High Reliability.* The best way to avoid the need for maintaining a repair capability is to build a quality system in the first place that will not need repair. While higher reliability will usually cost more to procure the system, operation and support costs may be less. Even if operation and support costs are more in terms of dollars, the cost in manpower and organization overhead must be weighed in terms of combat power trade-off. In conducting design to cost (DTC) analysis, DFD will usually compete with design to unit production cost (DTUPC), but complement design to operating and support cost (DTOSC).

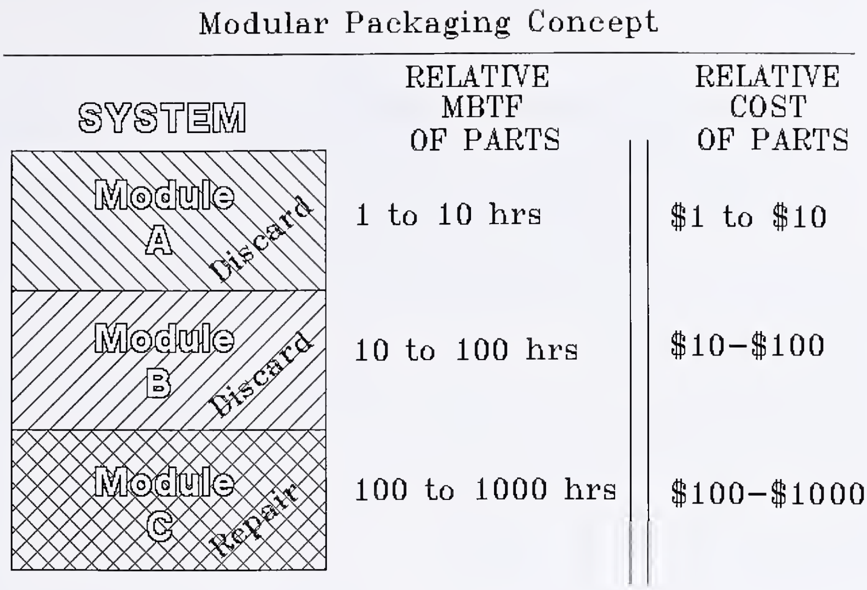

Figure 3

When DFD competes with DTUPC, the engineering design will be baselined in favor of DFD in lieu of repair. If DFD competes with DTOSC, the engineering design will be baselined in favor of reducing DTOSC, but will consider the manpower and force readiness costs as well as traditional O&S costs.

- *Parallel Redundancy.* Redundancy is a design concept usually reserved for systems that are high cost and require unusually high reliability or safety. Nuclear weapons, aviation and guided missile programs are typical systems that employ redundancy in their design. This need not be the case. Parallel redundancy is like having a spare part on-hand that installs itself when failure occurs. Failure of all parallel parts is required for the function to fail. Simple statistics predict a functional reliability in excess of 97 percent wherein the operability depends on any one of three parallel parts, each with a reliability of only 70 percent.

- *Packaging.* Packaging may be used in several different ways to enhance DFD. First, "cocooning" is done to raise the threshold of environmentally induced system failures by protecting vulnerable parts. "Cocooning" may be designed at the piece part level (such as plastic or ceramic coating of electronic parts), at the end item level (such as rough handling and dust protective cases for nondevelopmental item microcomputers), or at any level in between. "Cocooning" may also include active elements such as heaters.

Next, packaging the system into modules that contain piece parts and components with approximately similar mean times between failure (MTBF) and similar costs will enhance the discardability of those engineered for discard and the repairability of those intended for repair (see Fig. 3). This kind of modular packaging precludes the need to repair a module to prevent the loss of a more expensive or much longer-lived internal part.

Finally, packaging of components may be designed to take advantage of production processes, to prevent repair, or both. An example of this kind of DFD component packaging is to eliminate castings, machined surfaces, threaded holes or studs, and gaskets in favor of a stamped housing, either crimped, welded, or glued shut—designed as much to prevent repair as to lower production cost. The component in question could be a fuel pump, an alternator, an electronic "black-box", et cetera.

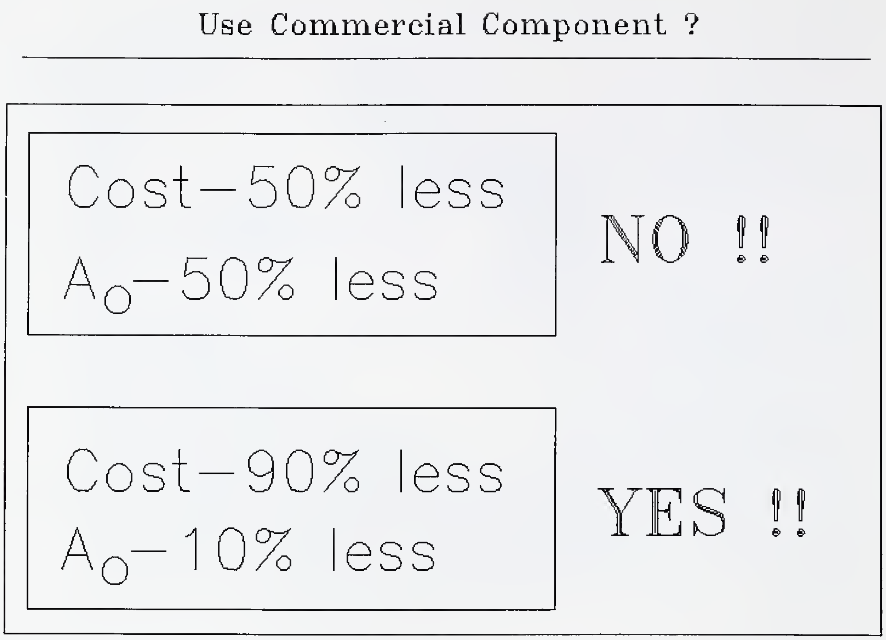

Figure 4

● *Commercial Components.* In rare circumstances, commercial components may be used in a system design because they are most reliable as the result of rapid advances in technology. However, normally commercial components will be considered to lower production cost, O&S cost, or both, but their use will frequently also lower the MTBF for the system. If a commercial component costs 50 percent less but also lowers operational availability by 50 percent, what is the value in using it in the design? On the other hand, if it costs 80 percent to 90 percent less and lowers operational availability only five percent to 10 percent, the component will be economically discardable without unacceptable degradation of operational availability (see Fig. 4). Establishing the cost and operational availability bounds is an operations research task to be done.

Discarding Discardables

Discarding items during wartime will be simply a matter of getting them out of the way and ensuring they are not useable in any way by the enemy. During peacetime operations, the picture is more complex. Because time is a less critical factor in peace, many discardable components and items may be repaired for purely economic reasons. Because time urgency in combat would not make repair and rebuild practical, no military organizational structure would be maintained for that purpose. However, a predominantly, if not totally, civilian peacetime table of distribution and allowances (TDA) organization might be maintained for the purpose of the wholesale disposal or recycling of discardable items. Discardable items logically fall into at least five categories, as follow:

● Item is repairable by depot, a government owned-government operated (GOGO) facility, a government owned-contractor operated (GOCO) facility, or a contractor in peacetime, but is discarded in wartime. (Consequently, the Army does not maintain a military structure to support retrograde and repair, a TDA civilian structure is maintained to process the item for peacetime repair.)

● Item is discarded and sold at some salvage value that recognizes the item will be rebuilt and sold back to the Army at a less-than-new price. (The Army maintains a TDA civilian structure to ensure the quality of rebuilt items being purchased.)

● Item is discarded, destroyed, and sold as scrap. (The Army maintains a TDA civilian structure to destroy these items so they cannot be rebuilt and recycled.)

● Item is discarded and sold as scrap.

● Item is discarded with waste disposal.

Bottom Line

"Use it up; wear it out; make do; or do without . . .", and in so doing the Army will expend vast amounts of resources, both manpower and dollars, that would produce more combat power—combat soldiers and war materiel, when and where most needed. Peacetime economic analysis may not support DFD on any scale greater than what the Army inherits in purchasing from the commercial world. The decision to earnestly design for discard in lieu of repair on a broad scale must be a readiness affordability decision. This author argues that because of the high intensity conflict expected on a future AirLand battlefield, the Army must lead and cannot afford to lag the example of the commercial world in Design-for-Discard.

The maximum return on DFD efforts will not be realized unless the Army maintenance and supply structure undergoes drastic change. However, pending actual change, the user must specify O&O plans and the developer must apply and solicit system engineering and design concepts based on replacement of disposable items in lieu of repairing them.

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Strengthening the Partnership Through Better Communication

More than 200 senior Army and industry executives attended the U.S. Army Materiel Command's (AMC) Atlanta XIII executive conference April 1–3, 1987, in Atlanta, GA.

The annual conference, which gives industry and Army managers the opportunity to discuss concerns related to the acquisition process, focused on the theme, "Strengthening the Partnership Through Better Communication."

Co-chairmen of the meeting were Robert O. Black, AMC's principal assistant deputy for research, development and acquisition, and John R. Myers, president, Avco Lycoming-Stratford Division.

Retired Army General Henry A. Miley, now president, American Defense Preparedness Association (ADPA), called the meeting to order. He reflected on Atlanta I, the first such Army-industry conference, which was held in 1973. Noting that he was AMC commander at that time, Miley said that the success of past conferences underlines the need for the Army and industry to meet, to discuss the achievements of today and to plan for future goals.

Co-chairman Myers then introduced GEN Carl E. Vuono, newly appointed chief of staff of the U.S. Army and former commander of U.S. Army Training and Doctrine Command (TRADOC). Commenting on the purpose and objective of Atlanta XIII, Myers identified key issues to be discussed at the conference, including affordability, producibility, capital investment, mutual trust and confidence, and restrictions and financial burdens in the contracting process. He noted that the Army has pushed hard to streamline the acquisition process; to bridge communication procedures between AMC and TRADOC; and to give industry the opportunity to speak to the government by sponsoring the Atlanta conference series.

Myers stressed the need for the Army customers and Army to communicate and work together. He noted that none of the other services devotes as much time to communicating with industry as the Army does with the Atlanta series.

AMC Commander GEN Richard H. Thompson followed with brief opening remarks, stressing that Atlanta XIII, like all conferences in the Atlanta series, is a productive time which will give the Army a strong sense of what is on industry's mind, giving the Army an essential focus for the next 12 months.

Thompson took this opportunity to announce his retirement and introduce his successor, GEN Louis C. Wagner Jr., Army deputy chief of staff for RD&A, as his replacement as AMC commander.

Thompson also reflected on Atlanta I saying that GEN Miley set in motion a process that has been sound and effective from the start.

"Given the realities of AMC's mission to support our soldiers with the best possible materiel, so they can do their job anywhere, at any time, on a moment's notice, and to use every tax dollar wisely and well, and given the reality of industry's need to profit and desire to prosper, we all need this chance to ask the tough questions, to hear the hard answers, and to work together toward solutions," Thompson added.

The first formal address, given by GEN Vuono focused on "War Fighting." Vuono cited the nation's security objectives as being: "first, to deter war; and second, to fight and win wherever in the world our security is threatened in joint and combined operations."

Vuono outlined ways in which industry can help the Army meet its War Fighting goals. First, industry must understand the Army's concepts for the future and what the Army expects to accomplish with them. Secondly, the opportunities must be identified for the application of advanced technologies to the military task at hand—lighter and more lethal hardware. Next, resources in the R&D community must be exploited to capitalize on Army strengths, operating against the enemy's vulnerability. Identifying the really fruitful opportunities for co-development, cooperation, and co-production with allied forces and sister services was another goal which Vuono identified.

Vuono also emphasized the importance of industry accommodating the personnel factors associated with new hardware items. According to Vuono, industry is essential to insuring that these hardware items have the survivability necessary to preserve the force and the capability to embed training and diagnostic devices into Army systems.

Atlanta XII Progress Report

GEN Thompson returned to the podium to present a progress report on actions implemented as a result of issues raised at the 1986 Atlanta XI conference. Beginning with acquisition streamlining, Thompson gave an update on actions taken to improve the streamlined acquisition process. These actions included institutionalizing the process throughout the Army by revising all related regulations, establishing an education network to unite the user, the logistics community and the staffs at Army and DOD levels, and publishing "how-to" books.

Other key initiatives to address concerns expressed at Atlanta XII have included:

- Eliminating bad specifications and standards in current Army contracts;
- Incorporating the Manpower and Personnel Integration Initiative, or MANPRINT, into the solicitation and source selection process;
- Implementing Design-for-Discard initiatives to reduce the logistics tail by designing items that are more realistic, less costly, and can be discarded;
- Rethinking how program acquisition strategies are structured so that the basic course of action is not fraught with unacceptable technical risks to insure a successful transition from development to production;
- Respecting and protecting industry's legitimate proprietary rights;
- Applying four-month-long contract definition phases to the Howitzer Improvement Program to better define

Assistant Secretary of the Army (Research, Development, and Acquisition) Jay R. Sculley (left) and Under Secretary of the Army and Army Acquisition Executive (AAE) James R. Ambrose answer questions from DOD and industry executives concerning developments in the Army reorganization and the role of the AAE.

the program, reduce the design to cost and identify risk areas for management;

- Establishing customer feedback centers at each major subordinate command.

Army Reorganization Update

Dr. Jay R. Sculley, assistant secretary of the Army (Research, Development, and Acquisition) (ASA(RDA)), followed with an update on Army reorganization developments. Sculley opened by stating that the idea for reorganization began with the President's Blue Ribbon Commission on Defense Management, the Packard Commission.

According to Sculley, the Packard Commission report, "A Quest for Excellence," recommended changes in four main areas. The first, planning and budget, which proposed the biennial budget and justification cycle, is intended to provide more stability. The second area, military organization and command, proposed reorganization of the Office of the Joint Chiefs of Staff to provide a stronger chain of command. Changes to the acquisition organization and procedures was the third area, which proposes stronger control and shorter reporting chains. The fourth and final area proposes area government/industry accountability and has led to signing of an ethics statement by more than 30 companies which do business with the government.

Sculley focused on the area of acquisition organization, citing the functions of the Office of the ASA(RDA). The ASA(RDA) will assure that reporting lines are short and program authority and responsibility lies with the program executive officer (PEO) for his programs and the program managers.

Specifically, the Office of the ASA(RDA) will be the proponent for: Army-wide acquisition policy; analysis and evaluation; program development and execution; and advanced technology programs. These functions will be incorporated into an organization with four main components—a deputy for technology, planning and assessment; a deputy for procurement; a deputy for program evaluation; and a deputy for systems, plans and programs.

Sculley also stated that the most important part of the Army reorganization is the management structure for the PEOs.

Under Secretary of the Army James R. Ambrose discussed in detail the PEO aspect of the reorganization and his own role as the Army Acquisition Executive (AAE).

According to Ambrose, PEOs will be established at a level that will usually include several program managers (PMs). A PEO will be an aggregator of the number of like or nearly like activities. For example, at the U.S. Army Tank-Automotive Command there is a PEO for tracked or armored vehicles, under which are PMs of Bradleys and tanks, and allied support vehicles, etc.

Ambrose added that most of the work will continue to be performed by the major subordinate commands (MSC). Therefore, it is imperative that the PEO and the MSC commander cooperate and work together. The focal point of decision-making will be between the PEO and the MSC in AMC. Somewhat different arrangements may be required in parts of the Army not included in AMC.

In closing, Ambrose quipped that his new title of AAE stands for "As Always, Expendable . . ."

Ambrose's address was followed by a brief question and answer panel session with Sculley and Ambrose. This session stressed the importance of cooperation between the PEOs and the MSC commanders.

Procurement Awards

This was the second Atlanta conference at which the Frank S. Besson Memorial Award for Procurement Excellence was presented. Named in honor of AMC's first commander, the award includes a plaque and a $500 check. GEN Thompson presented the award to one individual in each of three categories—civilian, military, and intern.

Barbara R. Ternak, a senior procurement analyst and assistant chief of the Competition Management Office at the Troop Support Command (TROSCOM), was cited for developing, coordinating and completing the command's Total Reevaluation Under SPRINT Thrusts (TRUST) Master Plan, which consolidated and organized 53 projects and 129 separate taskings. Ternak's efforts largely contributed to TROSCOM's achieving a competitive rate of over 90 percent in FY 86—a record for TROSCOM and the highest rate achieved by any buying command in AMC.

LTC James E. Ward, deputy division chief in the Procurement Directorate at the U.S. Army Missile Command (MICOM), was recognized for designing and implementing a repair parts contract action tracking system which was instrumental in MICOM's success in meeting the most ambitious program execution plan ever begun at MICOM. He also played a key roll in helping the Army achieve and maintain a 90-plus

percent operational readiness rate for 18 MICOM weapon systems.

Michael E. Karl, an AMC procurement intern in the Procurement Directorate at the U.S. Army Communications-Electronics Command (CECOM), was directly responsible for the breakout and award of several million dollars of computer equipment, which realized a savings of over $900,000 for the U.S. Government. Also, Karl developed a specifically tailored computer program to complete a multi-million dollar spare parts buy. With the aid of this computer program, Karl negotiated a $500,000 reduction in the contractor's proposed price.

Following the procurement awards, GEN Thompson presented a special award to GEN Miley for distinguished civilian service during his term as president of the ADPA from February 1975 to April 1987.

Luncheon Address

This year's luncheon speaker, Assistant Secretary of Defense (Acquisition and Logistics) Robert B. Costello, discussed five key initiatives that reflect the main thrusts of the Packard Commission Report, recent Congressional concerns, and some DOD assessments. An edited version of his remarks appears on page 28 of this issue of *Army RD&A Bulletin*.

Panel Sessions

The first of four panel sessions, featuring Army and industry perspectives on key issues, was devoted to a discussion on affordability. This discussion focused on industry's perspective on how to make weapon systems both combat effective and affordable through programs and activities such as Independent Research and Development, Materiel Requirements Definition, and contract preparation and execution.

MG Thomas D. Reese, commanding general, U.S. Army Missile Command, presented the government's view. To meet the challenge of making affordability and quality balanced, Reese called for a team approach to problem solving. Reese also cited four key areas of industry involvement—Independent Research and Development, Materiel Requirements Definition, contract preparation and execution.

Robert Parker, president, LTC Missiles and Electronics Group, provided the industry perspective on affordability. Parker compared Army programs and budgets to those of other services. He stated that the Army deserves a larger share of the DOD budget and noted that the Army procurement budget is smaller than that of Air Force Research, Development, Test and Evaluation.

Parker also cited the key elements in cost of overall systems and problems in those elements. For example, in one such key element, research and development, existing problems include: instability of requirements, contracting the terms of conditions, and poor communication between the bureaucracy and policy makers. Procurement, operation and maintenance costs and force structure were listed as other key elements.

Parker also discussed the problems associated with costs incurred by defense contractors for machining tools and equipment. There has been much debate as to whether contractors should be reimbursed for special tools and equipment necessary for the developmental and production stages of the acquisition process.

The subject of the second panel discussion was producibility. This session focused on what industry can do to enhance joint efforts to insure that producibility is well-planned prior to production to avoid problems during the transition from development to production.

In presenting the Army's perspective, Darold Griffin, deputy chief of staff for production, AMC, defined producibility as the measure of the relative ease with which a quality item can be manufactured.

"The bottom line is that there is only one reason to develop an item and that is because we want to produce it and field it, and we want to be sure that we manage it through life cycle and development to achieve that," said Griffin.

Industry spokesman for the producibility panel was A. Thomas Young, president, Martin Marietta Aerospace. Young presented a list of factors which can determine the difference between a successful and an unsuccessful transition from development to production. Included in these factors are: program commitment, sufficient development (front-end funding) and engineering funding, technical flexibility, hiring the right people for the job, using the new developments in design and production technology, and focusing on in-process quality.

Young offered some words of caution. The nation's security depends upon our technological superiority. According to Young, government and industry must remember the objective is producibility of technologically superior products.

The third panel discussion focused

GEN Richard H. Thompson (second from left) presents the Frank S. Besson Memorial Award for Procurement Excellence to LTC James E. Ward (far left), Barbara R. Ternak (center), and Michael E. Karl (second from right). Respective spouses of Ternark and Karl are also pictured.

on capital investment strategies for major weapon systems. MG Henry G. Skeen, commanding general, U.S. Army Troop Support Command, was the AMC spokesman.

In the past, the Army and other services have been criticized for providing excessive amounts of equipment and facilities to private contractors. The way business has been conducted has: hampered industry in efforts to develop better and more efficient production techniques, imposed government rules concerning accountability and maintenance, and in some cases, selected contractors without the demonstrated ability to mass produce the item, said Skeen.

According to Skeen, AMC requires industry to provide all production facilities of both capital and special nature needed to prove out technical data and production processes and to produce in quantity.

Donald J. Amoruso, senior vice-president and general manager, United Technologies, presented industry's perspective on capital investment strategies.

Amoruso stated that AMC's policy yields a risk to industry. All contractors have experienced the situation in major programs where initial planning is typically based on unrealistic assumptions, which are divorced from budgetary and political realities. Accordingly, there can be no guarantee of production at the start of a development effort, Amoruso said.

Amoruso added that contractors are asked: to provide proof of production capability on that tooling and test equipment and further during a competitive environment to win the development contract; to commit to ceiling price production options based upon the type and efficiency of the tooling and test equipment.

Amoruso concluded by asking for AMC to better balance the risk to industry by accepting more risk on the government's part.

The subject of the fourth panel was trust and confidence. Industry spokesman Donald B. Rassier, president, Ford Aerospace and Communications Corp., presented the contractors' perspective on the topic.

Stating that restoring trust and confidence is a government-industry imperative, Rassier listed four actions for each side to undertake.

For the industry side:

- Serious self-policing. This includes signing up to and living by the six-point initiative drafted in response to the Packard Commission Report, developing strong ethics programs, and voluntarily reporting waste, fraud, and abuse;
- Improve quality and producibility to include instituting a total quality excellence program based on continuous improvement in all processes;
- More aggressive involvement in defining and meeting user requirements; and
- Industry must combat misinformation. The public has a right to know when industry makes mistakes. They also need to know when government contributes to the problem.

Rassier's recommendations for the DOD side were:

- Stop making blanket indictments of industry for waste, fraud, and abuse. It fuels media hype and spreads misinformation through distortion and disregard for the magnitude of the problem;
- Establish a policy of collectively working to improve communications at all levels and across all levels;
- Focus auditing toward meaningful efforts. Develop an audit trail from the user to the end product to insure that the user requirements are accurately reflected in contract specifications; and
- Government must be as honest as it expects industry to be. This means stop making awards based on proposals that are not credible technically or otherwise;

Rassier concluded by stating that there is a lot both sides can and must do if the defense establishment is going to get back on track and win back the tax-payer's confidence.

BG Claude B. Donovan, deputy chief of staff for development, engineering and acquisition at AMC, presented the government perspective on the subject of trust and confidence.

Donovan responded to industry's concerns by citing causes or contributors to the lessening of trust and confidence on both the contractor and the government sides. The causes cited on the contractor side were: costs not being credible; political end runs; not standing behind the product; making promises that management, engineering and production cannot fulfill; signing pollyanna contracts; and not participating in DOD's voluntary disclosure program for those companies violating ethical codes.

Government contributions cited by Donovan were: a tendency to fix problems with rules and audits; late and transitory programmatic decisions; signing pollyanna contracts; fear of guilt by association; and poor handling of information.

Donovan also cited some principles for contractors to correct abuses and move toward self-policing. Among these are: a written code of ethics and conduct; employee values and standards of conduct; monitoring of compliance with federal procurement laws and voluntarily disclose violations; preserving the integrity of the defense industry; and companies must be publicly committed to these principles.

Donovan concluded by stating that demonstrating integrity in all said, done and thought is the one and only important tenet.

Two other panel discussions addressed the topics of restrictions in the contracting process and the financial burdens of contracting.

Robert L. Kirk, president and chief executive officer, Allied-Signal Aerospace and Electronics Co., was the industry spokesman for the session on restrictions in the contracting process. AMC spokesman was BG Michael J. Pepe, deputy chief of staff for procurement, AMC.

This session focused on how the complexity of the contracting process is increased by several restrictions and disincentives such as: reduced proprietary interest in data rights; "breakout" of components; and increased fixed price contracting without adequate procedures.

Industry spokesman for the final panel session, the financial burdens of contracting, was Thomas J. Keenan, president, Teledyne Continental Motors. AMC spokesman was MG Richard E. Stephenson, commanding general, U.S. Army Aviation Systems Command. This session focused on the concern that government-imposed policies and practices are increasing financial burdens for companies doing defense business.

Closing Remarks

GEN Thompson returned to the podium to conclude the 13th Atlanta conference with brief closing remarks. He stated that this year's Atlanta conference showed the highest level of professionalism in terms of depth and breadth of content in the panel discussions that he has seen in any of the past Atlanta conferences in which he has participated.

In closing, Thompson called for a continued partnership between government and industry, stressing the need for better communication.

Biennial Planning, Programming, Budgeting and Execution

By MAJ Charles R. Thompsen

Introduction

The Department of Defense Planning, Programming, and Budgeting System (PPBS) began in 1962 as a management innovation of Secretary of Defense Robert S. McNamara. The 25-year old system continues to evolve. The most recent revision, a very significant one, involves a shift from an annual to a biennial process. The transition is a dynamic one, aligning procedures, events, and schedules with a number of new concepts. This article provides an introduction to the background, efforts to date, and general direction the Army is going with regard to biennial planning, programming, budgeting and execution.

Background

The President's Blue Ribbon Commission on Defense Management, also called the Packard Commission, was chartered to "study the issues surrounding defense management and organization, and report its findings and recommendations." In February 1986, the commission submitted an *Interim Report to the President.* It provided a blueprint for overall improvement in defense management, and included recommendations concerning national security planning and budgeting, military organization and command, acquisition organization and procedures, and government-industry accountability.

The final report was delivered on June 30, 1986 and compiled the commission's full findings and recommendations. It also addressed recommendations concerning legislative oversight. While the four areas of the commission's study are inter-related, the recommendations concerning national security planning and budgeting are particularly applicable for guidance concerning the Biennial Planning, Programming, Budgeting, and Execution System.

The theme behind the Packard Commission recommendations includes operative phrases such as "the entire undertaking for our nation's defense requires more and better long range planning." It also suggests that long range planning must be based on military advice that is "fiscally constrained, forward looking, and fully integrated." The report went on to say: "... that a biennial budget process for defense, tied to a five-year defense plan, would promote stability by providing additional time to do a better job—to think through military planning options, to evaluate results of current and prior-year execution of the defense budget, and to ensure that each phase of the cycle has the attention needed."

Following the release of the *Interim Report to the President,* the president issued, on April 1, 1986, a directive to implement virtually all of the recommendations presented to him. This was known as National Security Decision Directive. Secretary Weinberger had already initiated many reforms, and the directive permitted DOD to build upon and go beyond what had already been accomplished. Once again, planning received much of the emphasis: "The requirement for stable and effective planning is becoming even more important. ... Our objective is to improve and stabilize strategic planning at the highest level."

The Secretary of Defense has continually communicated enthusiastic support for the biennial PPBS concept. In April 1985 he announced the initiation of a biennial planning cycle, and the FY 1988-1992 Defense Guidance, issued in January of 1986, was the first biennial Defense Guidance. That guidance initiated a biennial strategic planning process as a first step toward biennial programming and budgeting.

On June 18, 1986, Deputy Secretary of Defense Taft announced that the first two-year budget cycle would be FY 1988/89. He also directed that preparation for program and budget reviews in 1987 be stopped. This announcement was followed by a message from the HQDA director, program analysis and evaluation telling major commands to stop work on FY 1989–93 Program Analysis and Resource Review preparation.

With the submission of the FY 1988/89 OSD budget in January 1987, Secretary Weinberger reiterated his support of the biennial concept and cited the following "positive implications for budget review and execution of defense programs."

- *For DOD:* Greater program stability; more economic production of military equipment; enhanced program planning and execution.
- *For Congress:* Opportunity for long-term view of budgetary commitments, their effect on future resources and policy decisions, and the relationship between strategy and resources. Also, the two-year process will permit the Congress to concentrate on broad policy choices, priorities, and oversight reviews, rather than be constrained with the detailed annual review of national defense budgets.
- *For Industry:* Lower costs through a two-year commitment to production and resources, replacing the uncertainties of annual "roller-coaster" funding levels.

The provisions of the Goldwater-Nichols DOD Reorganization Act of 1986 also clearly support the Biennial PPBES concept. The realignment of functions and the reorganization of HQDA must be supported by a streamlined and operative BPPBES process. Further, the act brings many changes associated with operations in a joint environment. The chairman of the joint chiefs of staff has been given increased programatic authority which could significantly impact upon the services' PPBS.

Strategic planning will conform to constrained resource levels. The joint staff is continuing to study the overall implications of both National Security Decision Directive 219 and the reorganization act. Procedures for implementing revised planning and programming responsibilities are currently being determined.

Congressional support of the move to biennial budgeting has been mixed.

The FY 1986 DOD Authorization Act directed the president to submit the biennial FY 1988/89 DOD budget in January 1987. Language of the act stated a "biennial budget for the Department of Defense would substantially improve DOD management and congressional oversight."

The appropriations committees have not announced a formal position concerning the biennial budget; however, staff members of those committees have indicated their opposition. It is possible that DOD may continue receiving annual appropriations, even if the authorization committees, the House and Senate Armed Services Committees, provide two-year authorizations.

Biennial PPBES Task Force

On July 17, 1986, the Honorable Michael P. W. Stone, assistant secretary of the Army (financial management), chartered a Biennial PPBES Task Force. Its purpose is to "ensure a smooth and timely response to the desires of the president and the secretary of defense for implementation of the Blue Ribbon Commission on Defense Management (Packard Commission) recommendations for National Security Planning and Budgeting."

The task force first had to look at the current Planning, Programing, Budgeting and Execution System. To do this, a conference room was set up with butcher paper lining the walls from floor to ceiling. A time line was charted from FY 1986 through FY 1992. Posted on this butcher paper were the various systems, processes, and documents that have all evolved to be a part of this incredibly complex system. Color codes were assigned to the various phases/agencies. Strings connected the various blocks to show relationships.

As the different agencies and selected major commands (MACOMs) posted their systems on the wall, it became apparent that there was not enough space to overlay all of the activities that support the PPBES. The task force then decided that in order to go about its business, it had to first lay out the "architecture" of the major events, processes, and milestones as a proposal. The supporting systems could then be positioned according to where they are required. The task force was able to start with "a blank sheet of paper," and from that develop implementing procedures to support the operational and strategic concerns of the Army.

Transition to the BPPBES

The transition to Biennial PPBES proved a unique opportunity to correct problems and disconnects that have evolved over time. The elimination of the Program Objective Memorandum (POM) and Budget development during FY 1987 has provided additional time for the analysis needed to correct many of these problems. Great care has been taken to ensure that the time is not being used to "revisit" guidance or to create increased instability for those doing analyses and preparing submissions.

Early observation showed that without careful and timely planning, the Planning, Programing, Budgeting Execution system could evolve to "an annual cycle, every other year" and could lead to an undesired period of intense effort followed by periods of lesser activity. Using a number of previously described sources as references, a set of planning assumptions have been developed, and the framework for a new system is taking shape.

A critical new process called the Force Integration Analysis (FIA) has been established to support the intent of the reforms to add "more and better planning." This analysis is intended to answer such questions as:

- Is the Army programed force executable?
- Is the force affordable?
- Can the force be equipped?
- Can the force be manned?
- Can the force be trained?
- Can the force be provided facilities?
- What is the capability of the force?
- How are the commanders in chief supported?

The FIA process has matured over the past several months. Beginning with the overall concept, the process has now been developed into a more detailed set of analysis guidelines, functional responsibilities, and key milestones. Extensive coordination with HQDA staff personnel and representatives from select MACOMs has resulted in substantial improvements to the Army planning process. As the planning phase transitions to the programing and subsequent budgeting phases, additional refinements to the PPBES can be expected.

Implementation of the Program Executive Office (PEO) concept of operation commenced earlier this year. Proposed organization structures and programs are now being developed. New procedures must be developed in consideration of all aspects of Army resource allocation and prioritization processes and must fully support the emerging PEO structure.

The overall conceptual architecture has been developed, but much work remains to be done for the full transition to a biennial PPBES. Informal sessions to exchange ideas and concepts have been held throughout HQDA, with MACOM/agency representatives, with Army schools, as well as with the Office of the Joint Chiefs of Staff, the Navy and the Air Force staffs. As with any change to an existing system, the task force must overcome difficult bureaucratic terrain in the path of efforts to change.

Summary

Questions frequently arise phrased something like, "Why are you working on this biennial business, when it probably won't ever really happen?" The answer is that we have already gone biennial in planning, programing, and budgeting. The joint documents, the Defense Guidance, the Army Long-Range Planning Guidance, and the Army Plan are all scheduled and being issued on a biennial cycle. Program Analysis and Resource Reviews are not being submitted this fiscal year, nor will a POM be developed and submitted. OSD submitted its first two-year budget, for FY 1988/89, to Congress in January 1987.

The review and analysis processes are being designed and positioned to ensure that strategic and operational considerations are fully supported in the development of that force programing and budgeting. Feedback of program execution is being built into the system so that policy makers and programers will be able to improve subsequent cycles.

The Biennial PPBES Task Force must still consider a variety of issues. While there remain a number of uncertainties associated both with Congressional response and DOD/JCS implementation of the reorganization act, a number of Army efforts have already proven worthy. The examination and questioning of the "way we've always done business" has been healthy and positive.

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Next Generation and Notional Systems:

A Key Part of the RDA Investment Strategy

By John V.E. Hansen

Introduction

AMC's research and development budget in the technology base (6.1, 6.2, and 6.3a) currently is close to $1 billion a year. Allocating these resources to the Army's most critical needs is a difficult task, and it falls on the shoulders of the U.S. Army Laboratory Command (LABCOM).

Part of LABCOM's management initiative has resulted in the development of an investment strategy that includes, as a key element, the articulation of next generation and notional systems. These not only assist in the planning and execution of the Mission Area Materiel Plan (MAMP), but provide a balance between the near-term and long-term needs of the technology base.

Apportioning the resources available for the technology base requires consideration of a number of elements. Because of conflicting demands and directives from higher headquarters, seemingly irreconcilable differences in priorities emerge. The goal is to strike the most sensible balance between the several needs that must be met, and to protect less visible needs in the face of the clamor associated with high-visibility programs.

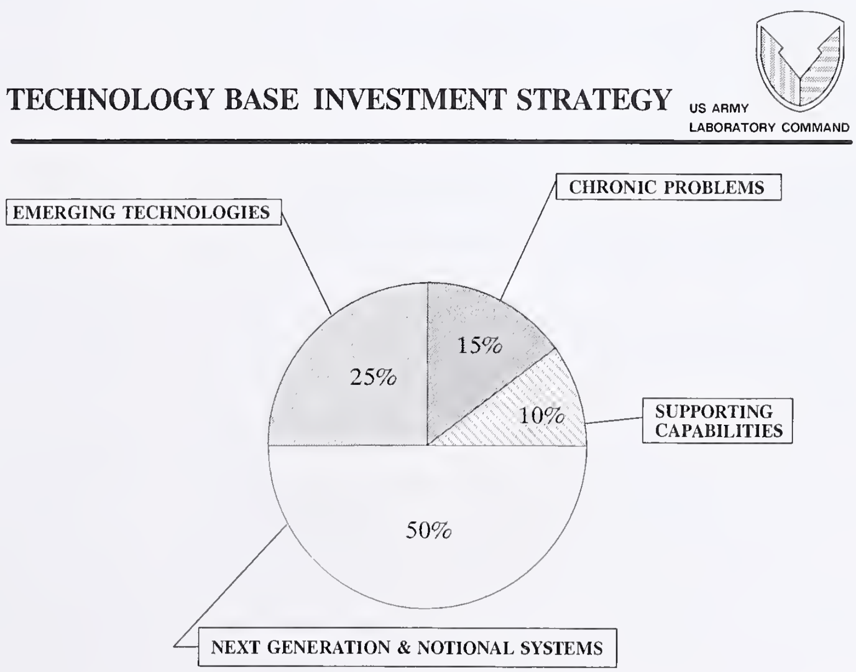
Technology Base

The technology base has several facets. To many, it is that portion of the RDA cycle prior to full-scale development. This is the segment identified with the MAMP, and it is driven by the deficiencies articulated in the Training and Doctrine Command's (TRADOC) Battlefield Development Plan (BDP). To others, the technology base is the resource that must fund the "quick fixes" and pressing needs associated with chronic and/or pervasive problems, such as overcoming corrosion problems, or reducing O&S costs.

Another facet of the technology base is its support for the exploitation of emerging technologies that can provide wholly new battlefield capabilities. A fourth view sees the technology base as the resource supporting the instrumentation and facilities needed to conduct research and development. Which of the foregoing is the correct view of the technology base? Answer: all of them.

If all of the foregoing areas must be supported by the technology base, a prioritizing system would be highly desirable, given that the demands on the tech base will always exceed the resources available. However, since each area is driven by separate needs, and since each must be supported, the assignment of priorities across the four areas mentioned is virtually impossible.

A more workable alternative is to allocate specific portions of the technology base to each area, and then use a prioritized system (tempered by common sense) to allocate funds within each area. Starting with the recognition that all four areas must be supported, a review of past experiences coupled with judgemental factors led to the following apportionment: solution of the BDP deficiencies, 50 percent; chronic/ pervasive problems, 15 percent; emerging technologies, 25 percent; and supporting capabilities, 10 percent. These represent guidelines rather than fixed requirements for several reasons.



A primary reason for establishing these apportionment figures as guidelines, as opposed to firm requirements, is the recognition that the needs and the environments of the various development centers and laboratories vary significantly. Those dealing in commodities or technologies of interest to industry can often find developments that can be adopted; those needing advances in highly classified areas, or in commodities that are peculiar to Army needs often demand a greater portion of the technology base effort.

Yet another reason for expecting variation among the AMC R&D elements is that there will be instances in which a critical technology or commodity (which may impact other labs or centers) is assigned to a single element. This focusing of effort not only minimizes duplication, but assures a dedicated effort that can be more readily managed. In such cases, the laboratory or center which has primary responsibility for a given area is apt to control the resources that fund efforts in other labs and centers. The distribution of funds will reflect this, and as a result, the balance among the four elements of the technology base may vary between the labs and centers.

Another factor that will shift the distribution of tech base funds between the four areas is the commonality of interest that may exist with other services. This can lead to shared programs, and thus reduce the burden on an AMC laboratory in supporting a given technology.

Of the four areas supported by the technology base, the need to satisfy BDP deficiencies deserves most attention. It is the major element in the technology base, and it is the primary reason for AMC's existence. A brief look at the history of this area also provides perspective leading to the development of the current investment strategy.

Ten years ago, the technology base within AMC was guided by perceived needs of future Army systems. The scientists and engineers took direction from a number of guidance documents, but more often than not, these left room for considerable interpretation. One particular weakness was the lack of specific time lines for future systems, which precluded realistic long-range resource allocation, not only in the technology base, but in other areas as well.

Perhaps more important, the planning documents provided little insight regarding the concepts envisioned by the user in utilizing new systems. In part, this reflected a relative disconnect between the user and the developer in terms of the activities of the technology base. By practice and policy, intense user-developer dialog ensued only as new requirements for specific near-term systems began to emerge. It is not surprising that this environment also occasionally raised questions as to the relevance of the technology base efforts to what the Army really needed.

In the years since, a number of changes have occurred both within AMC and TRADOC, and between the two organizations. Perhaps the most significant was the realization that the efforts in the technology base were critical in shaping the ultimate cost, manpower, and logistic support of future systems. As such, the process demanded participation not only by TRADOC, but by other AMC elements as well.

The scientists and engineers involved in managing the technology base recognized that pursuing technology base efforts without an appreciation of the user's needs was ill-advised, and this meant that they had to become familiar with TRADOC's concepts. The process underwent a number of changes and evolved to the process we have today: Mission Area Analyses are performed by TRADOC, culminating in definitive and prioritized deficiencies, which become the primary guidance for the technology base. This is also the mechanism by which the technology base provides its input to the Mission Area Materiel Plan, or MAMP.

MAMP

The MAMP drives the technology base in several ways. It is intended as a strategic planning document, laying out the projected development schedules of the systems planned for the future. The individual Mission Area strategies are reviewed by headquarters TRADOC and AMC to achieve a horizontal integration that transcends the individual Mission Area boundaries. This "cross-walk" may show opportunities for achieving synergistic effects and thus reduce the total development resources required.

Once this overall strategy yields the time lines of future systems, the technology base programs are reviewed to assure that they will maximize the utilization of tech base resources, and be in full support of the systems and schedules spelled out in the MAMP strategy.

We have come a long way in forging a developer-user linkage for management of the technology base, but further improvements are underway. The BDP deficiencies address the obstacles that hinder or prevent the successful employment of desired concepts. However, because the majority of the deficiencies address needs foreseen in the 10–15 year period ahead, they provide a near-term focus for the tech base, at the expense of the longer term needs.

In addition, to be of most value in evaluating future battlefield concepts, the technologies addressing the deficiencies must be translated into battlefield capabilities. The vehicle by which this is achieved is the articulation of projected systems which reflect not only the capabilities foreseen, but the technological obstacles that must be addressed as well.

Next Generation Systems

To achieve a better balance between the near-term and longer-term tech base efforts, the concept of "next generation" and "notional systems" has been developed. The systems that will address the majority of the current BDP deficiencies are the "next generation" systems. That is, they will be the systems following the ones currently in development. They also become the focus for the immediate needs of the tech base, since for systems that have already entered full-scale development, the tech base work must already be complete.

The significant factor is that these "next generation" systems are not characterized by any specific common attributes. Their common characteristic is their time of entering full-scale development: they will all follow the systems currently in development. Thus, for any system rapidly nearing type classification, its next generation may begin in the near future. For systems that have only recently entered development, their next generation will begin development at least four years from now.

Notional Systems

Focusing the technology base entirely on the next generation systems and the relatively near-term deficiencies they address, has distinct disadvantages, however. It provides an almost myopic view, preventing adequate attention being given to the potential quantum jumps that could be achieved in the long term, or in radically new approaches to overcoming deficiencies.

To achieve a balanced program, the longer term needs are being addressed by conceptualizing "notional systems." By definition, these would be the systems that would normally follow the "next generation" systems. They are intended to capitalize on technological developments that will provide significantly new or improved battlefield capabilities.

While such notional systems are apt to be in the time frame beyond the next generation systems, this is not a hard and fast rule. Truly revolutionary notional systems may emerge from the tech base faster than originally expected, and will be factored into the overall MAMP strategy to accelerate fielding whenever the potential benefits warrant.

The concept of next generation and notional systems is intended to focus on the technological barriers—or "showstoppers"—that are impeding the development of these systems. Toward this end, the most critical systems are being scheduled for "tech demos"—demonstrations that will verify the technological barriers have been overcome, thus smoothing the way for transition into full-scale development. Currently, 20 such key tech demos have been programmed.

Another recent development that assists in providing the proper focus for the longer-term tech base effort is the AMC-TRADOC effort being conducted in support of the new initiative, Architecture for the Future Army. This architecture provides a conceptual evolution of AirLand Battle doctrine into the 15- and 30-year future. It also includes the evaluation of the Army 21 plan, and the exploration of new technologies and concepts that could be employed by the Army in the years ahead. The goal is not only to assess the merits of various new battlefield concepts, but to provide AMC with a sensitivity analysis that will shape its long-term technological focus.

Conclusion

With the development of MAMP strategies reflecting both next generation and notional systems, a balance is being achieved in allocating tech base resources to both the near-term and longer-term demands of the tech base. In addition, the near-term and notional systems are those which are considered the most critical in fulfilling Mission Area strategies, and thus provide the focus for technology base efforts.

Finally, with the recognition of the need to support the complementary areas of the tech base (e.g. emerging technologies, chronic problems, and institutional needs), a process is evolving to permit a more defensible and balanced management of the technology base. Equally important, the process is more closely linked with the Army's battlefield needs (both near and far term) than ever before. Given the economic outlook for the years ahead, such an investment strategy will enable AMC to satisfy the most critical Army needs efficiently.

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Belvoir Studies Flail Technology

Foreign mine clearing "flail" technology is being evaluated by the Troop Support Command's Belvoir RDE Center to determine its effectiveness and suitability for the U.S. Army.

A vehicle designed by the Aardvark Mine Ltd. of Aberdeenshire, Scotland, will be tested by the U.S. Army Armor and Engineer Board at Fort Knox, KY, to obtain data that could eventually result in a tank-width vehicle mine clearing system for combat engineers.

The basic design being evaluated by the center weighs 13½ tons, 10 tons for the prime mover and 3½ tons for the flail unit. Mounted at the rear of a custom-built half-track vehicle, the unit consists of a 10-foot wide rotor and 72 to 79 chains with disc-shaped striker tips. Other features include automatic contouring and depth control, retractable sidearms for air transport, an armored cab and an optional rotor with 60 heavy chain tips for use against buried anti-tank mines.

CORRECTION

Due to a printing error on Page 1 of the May–June 1987 issue of Army RD&A Bulletin, incorrect information was published on the objectives of the Joint Live Fire Testing Program. The four objectives of the program should have read as follows:

- To assess the vulnerability of U.S. combat systems to conventional threats,
- To assess the lethality of U.S. conventional combat systems against foreign threats,
- To gain insights into methods of reducing the vulnerability and improving the lethality of U.S. weapons and weapons platforms, and,
- To provide a data base to improve the computer modeling of weapons system lethality and vulnerability.

Advanced Technology for Future Trucks

By George Taylor III

The U.S. Army Tank-Automotive Command (TACOM), Warren, MI, and General Motors are involved in a joint project aimed at demonstrating the feasibility of applying advanced technology in future tactical trucks to make them lighter and improve their mobility and performance. The effort began in September 1986 when TACOM awarded GM a 30-month contract to build a 5-ton modern technology truck demonstrator.

The vehicle will be built on the chassis of an existing M923 cargo truck. But many of the other major components will be different from those used in the standard vehicle. Moreover, most of the new components will be lighter, and are expected to make the truck demonstrator weigh about 2,000 pounds less than the current M923.

The objectives of the project are to demonstrate enhanced mobility and propulsion, and to upgrade future-generation tactical-vehicle specifications.

Although GM is building the truck, most of the components being used are not made by GM. TACOM furnished GM with the truck chassis and the transmission to be used. For the rest of the vehicle, GM was told to select what was considered to be the best components for the truck, regardless of who makes them.

The engine will be a modified version of a 7.6-liter, 6-cylinder diesel now being developed by the John Deere Co. It is estimated that the new engine can develop 275 horsepower. This is 35 horsepower above that of the current 5-ton truck engine, a 14-liter diesel weighing nearly 50 percent more. The higher horsepower output of the new engine is being achieved by using a new high-pressure fuel-injection system, an improved turbocharger and electronic engine controls. These new components will improve the performance characteristics of the engine and provide near optimum fuel-injection timing that will achieve greater engine thermal efficiency.

Although the new engine is designed to develop more power than the standard 5-ton truck power plant, the radiator needed to cool it will be smaller and lighter. The reason for this is that the turbocharged air—which in liquid-cooled engines is usually cooled by the radiator coolant—is cooled by an independent cooler that uses outside air for cooling. Thus, the amount of heat to be rejected through the radiator will be reduced significantly.

Under terms of the contract, GM will incorporate additional features into the technology demonstrator engine. Among these will be a single belt to drive the alternator, cooling fan and other belt-driven accessories instead of the seven belts now used, and a Donaldson "Z" flow advanced air cleaner. Moreover, there will be an improved starting system that will make starting easier in a low-temperature environment. It will include an intake-air heater, a more powerful battery and improved battery cables.

The truck will have an experimental transmission that combines the benefits of automatic and mechanical transmissions. Developed by Eaton Corp., the transmission consists of a commercial 16-speed manual truck gearbox, transfer case and clutch. But there is no clutch pedal because the gears are shifted automatically during acceleration and deceleration. This is done by using electronic controls to automatically engage and disengage the clutch

Access doors are located on the side and top front of the hood of demonstrator for engine and transmission oil-level checks, oil replenishment and for checking of radiator fluid level.

and control engine speed during shifting, and a compressed-air-actuated shifting mechanism to change gears. The driver will operate this transmission just like a regular automatic.

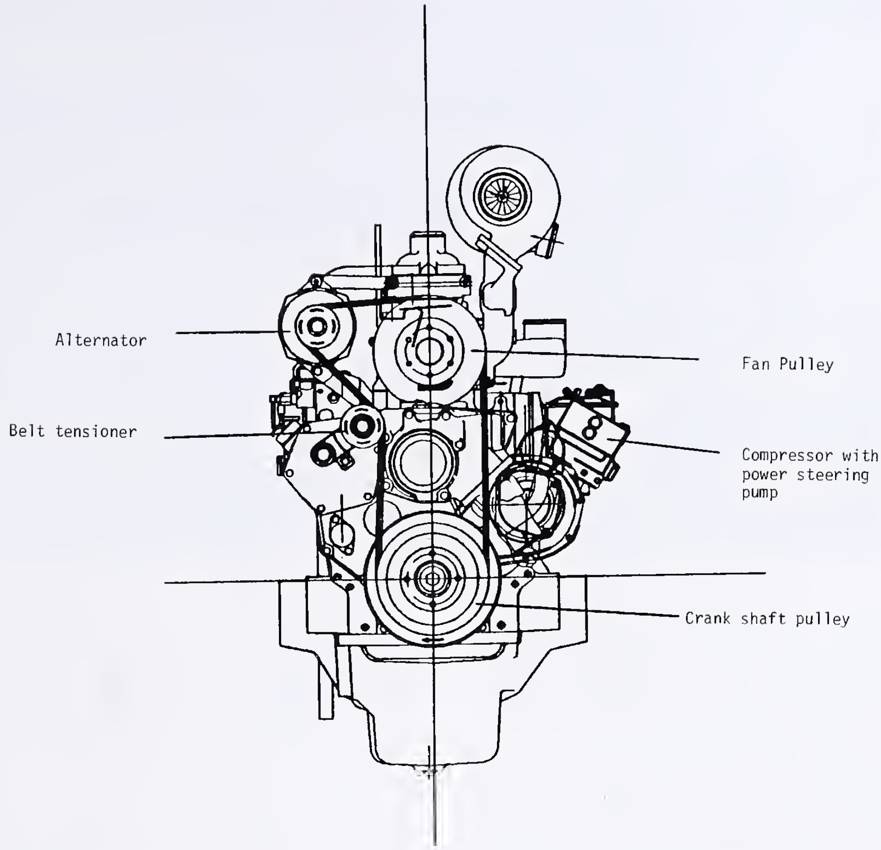
There are several advantages that an automated mechanical transmission would offer over a conventional automatic. For one thing, it could mean reduced maintenance and repair costs, because a manual transmission has fewer internal parts. Additionally, the clutch would eliminate the need for a torque converter and its associated cooling requirements. A torque converter provides varying amounts of slippage between the engine and transmission during low-speed operation, acting as a variable-ratio coupling. This slippage generates heat which must be dissipated through a cooling system to prevent the transmission from overheating.

Elimination of the torque converter would also result in improved fuel economy, since there is no slippage between a mechanical gearbox and the engine when the clutch is fully engaged.

The truck will also have a new axle design developed by Rockwell International, in which some of the drive-reduction gears—normally located in the differential housing at the center of the axle—are contained within each wheel hub. This change makes it possible to increase vehicle ground clearance and reduce the weight of the axle.

The differential will provide dramatically improved traction on ice, snow and mud. It features an advanced torque-biasing system with a ratio of six to one. Like the common limited-slip differentials found on some passenger cars and trucks, this system automatically shifts the driving torque away from a wheel which has poor traction and begins to slip, and transfers it to the opposite wheel. But unlike a conventional differential, which applies equal torque to both wheels, this one incorporates a new design that enables it to multiply the torque being transferred to the non-slipping wheel by six times the amount originally transmitted to the slipping wheel.

Another feature of the truck will be a central tire inflation system to enhance mobility. It will allow the driver to change the tire pressure from inside the cab to maximize traction during operation on paved highways, sand, cross-country terrain and when immobilized in mud or snow. The truck will use single wheels on all three axles, and the tire size will be 14.00x20.



John Deere's 6466H 5-ton truck demonstrator engine with single-belt accessory drive.

The truck will also have a somewhat different outward appearance than its standard counterpart. The most significant change will involve moving the cab rearward to eliminate a 16-inch space between the cab and cargo box, which in the standard truck accommodates the spare tire, and moving the tire to a position beneath the truck. This change will serve two purposes. First, it will permit the use of a lower, more sloped hood that will improve driver visibility and enhance the truck's aerodynamic characteristics.

The hood will be made of lightweight composite materials and will feature access doors on each side that will allow the driver to check engine, transmission and radiator fluid levels. Moving the cab rearward will also provide additional space in the engine compartment. The extra room will make trouble-shooting and repairing easier by permitting a three-man crew to remove or install the engine, transmission and cooling system hardware as a single power pack module within 20 minutes.

Other features of the truck will include a new air-actuated brake system that will provide better braking than the current system, and a new leaf-spring suspension with high-performance shock absorbers on all three axles that will enhance vehicle mobility and ride quality. (The current 5-ton truck series has no shock absorbers on the two rear axles.)

General Motors will complete fabrication of the truck by January 1988. Then, following a shakedown test and a successful demonstration for TACOM engineers at GM's Milford Proving Ground, MI, the truck will go to Aberdeen Proving Ground, MD, for 4,000 miles of performance and mobility tests. If all goes well, the program will enter a second phase, in which other new or improved components will be added to the truck and tested.

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Reverse Osmosis Water Purification Equipment

By David A. Cole

Introduction

The field Army must find its raw water source wherever available and must purify this water to a level commensurate with that obtained by civilian practice, even though the raw water is highly polluted, turbid, colored, salinated, or is characterized by excessively high or low pH. Furthermore, the problem may be compounded by the presence of nuclear, biological, or chemical warfare agents.

The Army processing procedure must frequently be carried out under adverse weather and climatic conditions. In addition, the equipment designed to do the job must be simple, lightweight, rugged, self-contained, and transportable. It is a tough assignment, but an imperative one that must be done. It must be remembered that the U.S. Army will probably be outnumbered in any future war. Therefore, it is essential that the U.S. soldier be survivable, since replacement forces may not be available.

Historical Perspective

Looking back in history, in most wars that have ever been fought, more soldiers lost their lives due to disease than to enemy action. The first war fought by the United States, the Revolutionary War, was no exception. John Adams of the Continental Congress wrote "Disease has destroyed 10 of us where the sword of the enemy has killed one." The underlying cause of this situation included such items as lowered body resistance due to exposure and fatigue, crowded quarters, primitive sanitation, inadequate personal hygiene, improper nutrition, and contaminated water. In the 18th century, medical science was more medieval than modern, and basic health guidelines had not yet been established. In so far as is known, no water purification equipment was provided. It is assumed that the revolutionary soldier drank whatever water he could find, clarity to the eye being the principal criterion of purity.

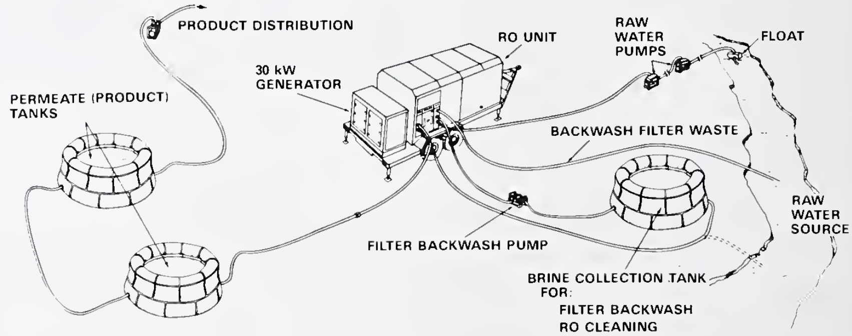
Subsequent to the Revolutionary War, people increasingly recognized that the provision of pure drinking water in the field is essential to the successful prosecution of Army operations. However, the wars following the Revolutionary War and up to World War I (WWI) probably saw little improvement in the quality of the drinking water used by the individual soldier. In WWI however, a serious attempt was made to provide the American Expeditionary Force with potable drinking water. The principal piece of equipment used was the "Mobile Water Purification Unit," featuring sand filtration and chlorination.

In World War II (WWII), it became increasingly apparent that it is absolutely imperative that the field Army be provided with potable and uncontaminated water for drinking, washing, culinary, bathing, laundering, and dehydrated-food-reconstitution purposes. Being fought on two radically different fronts, WWII required two approaches. In the European theater, where the raw water available was primarily polluted fresh water, batch coagulation, diatomite filtration, and chlorination were practiced. In the Pacific theater, where the raw water available was primarily sea water, distillation was used.

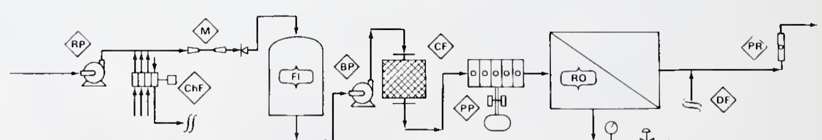
Subsequent to WWII, a complete line of water purification equipment was developed which is still used today. ERDLator units with capacities of 420, 600, 1,500, and 3,000 gallons per hour (gal/h) were developed to purify polluted fresh water. These same units,

600 GPH ROWPU
(FIELD ARMY MULTIPURPOSE WATER PURIFICATION UNIT)

ISOMETRIC LAYOUT VIEW



BASIC FLOW SHEET



LEGENO

RAW WATER PUMP	RP	PRESSURE PUMP	PP
CHEMICAL FEEDER	ChF	REVERSE OSMDSIS	RO
MIXER	M	BRINE RDTAMETER	RB
FILTER	FI	DISINFECTANT FEED	DF
BOOSTER PUMP	BP	PRODUCT RDTAMETER	PR
CARTRIOGE FILTER	CF		

augmented by the CW/BW Pretreatment Set, could effectively treat water contaminated with chemical and biological warfare agents.

A 150 gal/h distillation unit was developed to purify sea water and brackish water. ERDLator units were augmented with the Post Ion Exchange Unit to treat nuclear warfare agent contaminated water.

Although the above equipment was satisfactory, it became apparent during the 1960s, as the "Modern Mobile Army" was being developed, that there is a distinct need for a single water purification unit capable of purifying most of the raw waters that could be encountered in the field. Specifically, the unit should be capable of purifying raw fresh water; sea water; brackish water; and water contaminated with nuclear, biological, and chemical (NBC) warfare agents.

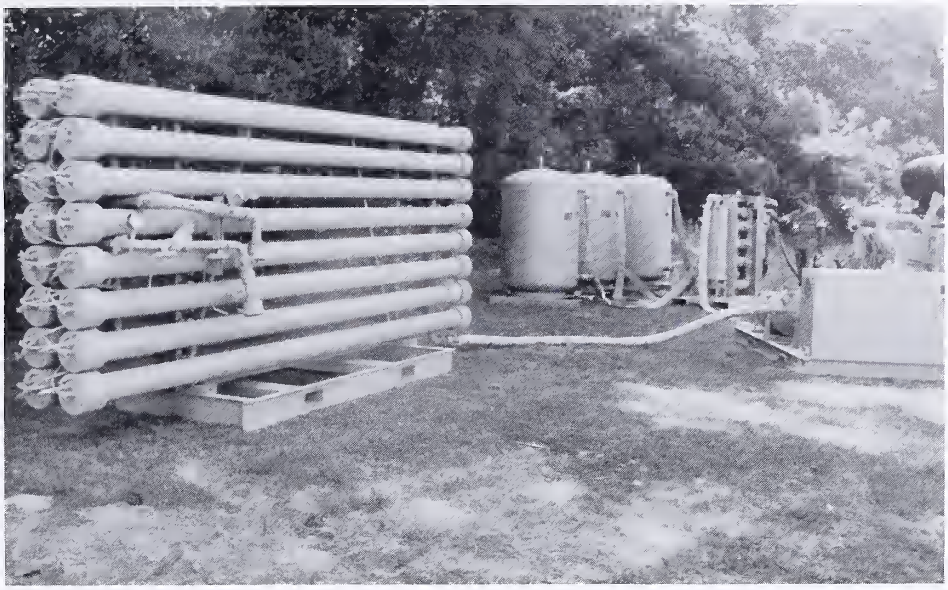
The Belvoir Research, Development and Engineering Center (then Engineer Research and Development Laboratories), Fort Belvoir, VA, gave serious consideration to the technical feasibility of developing such a unit. Although clarification and disinfection are essential, the major factor involved was desalination. This is the most difficult thing to accomplish, and it was apparent that desalination would become the heart of the multi-purpose water purification unit.

Reverse Osmosis

Various candidate desalination processes were examined, and as a result of a trade-off analysis, it was determined that vapor compression distillation was by far the optimal choice for an Army field desalination/water purification unit. Plans were made to develop such a unit. However, before such a development project got underway, a new and very promising desalination process appeared on the horizon—reverse osmosis.

Reverse osmosis is a membrane separation process. Raw water is pressurized to a value above the osmotic pressure of the dissolved substances present. Under this circumstance, pure water passes through the membrane, leaving most soluble salts behind. At the same time, all particulate matter, should any be present, would be removed. Such matter would include micro-organisms and suspended solids.

After procuring and testing a 1,000 gal/day reverse osmosis unit developed by industry, the Army took another hard look at the entire desalination picture, particularly reverse osmosis. Then on June 22, 1972 at the Eighth Army Science Conference, West Point, NY, a Belvoir representative delivered a paper entitled "Development of a Multipurpose Water Purification Unit for Army Field Use." The proposed unit was based on the reverse osmosis principle utilizing a spiral-wound configuration. The delivery of this paper was the "kickoff" of the Army Reverse Osmosis Water Purification Unit (ROWPU) program. The official need for such a unit was stated in a Required Operational Capability (ROC) document dated March 4, 1974. Extensive research and development followed.



150,000 GPU Reverse Osmosis Water Purification Unit.

A 600 gal/h Reverse Osmosis Water Purification Unit was type classified on June 1, 1979. The 600 gal/h ROWPU is 18 feet long, 8 feet high, and 8 feet wide. It weighs about 8½ tons, including the generator set. Special pumps, controlled by a built-in control panel, move the water through the ROWPU to produce as much as 10 gallons of drinking water per minute. This water is stored in collapsible tanks that can hold up to a total of 3,000 gallons. The 600 gal/h ROWPU can be transported by rail, road, or air, and can be safely dropped by parachute from a C–130 cargo aircraft.

In response to a requirement from the U.S. Central Command forces, 26 150,000 gal/day ROWPUs were procured on a Nondevelopmental Item basis. Six of the units were mounted on three standard service barges (2 units per barge). In addition, a single unit was placed on a Lighter Aboard Ship barge.

To meet the basic requirements for a 3,000 gal/h ROWPU, and in accordance with DA and Army Materiel Command directives, two competing, performance type contracts were awarded April 12, 1984 to develop a 3,000 gal/h ROWPU. The units are being subjected to an accelerated acquisition program, with type classification projected for the latter part of 3QFY87.

The resulting unit will be capable of producing potable water from fresh water, sea water, brackish water, and water contaminated with NBC agents. The unit will be transportable on a 30-foot flatbed semitrailer pulled by a 5-ton M931 or M932 truck tractor. It will be capable of being air lifted by a C–130, C–141, or C–5 aircraft and transported on a seagoing military vessel.

The Belvoir Research, Development and Engineering Center recognized that, although the current line of water purification equipment is performing satisfactorily, smaller, lighter, simpler, cheaper, more maintainable, and more efficient units will be required to meet future Army (ARMY 21) requirements. Therefore, plans are underway to develop an advanced "High Technology ROWPU" (High Tech ROWPU).

The High Tech ROWPU requires the development of five new components and automated control. It is believed that all five components are practicable, which would result in a brand-new streamlined reverse osmosis unit for the field Army. However, any one

component proving practicable could be worked into present systems on a product improvement program basis.

Summary

In summary, the 600 gal/h ROWPU has been type classified and fielded, and is being used by all of the armed services. The 3,000 gal/h ROWPU is nearing the end of its engineering development cycle, with type classification projected for the latter part of 3QFY87. A new "High Tech" ROWPU is in the applied research stage, and, if fully developed and perfected, could supplant all existing ROWPU equipment.

DAVID A. COLE is a captain in the U.S. Army Reserve. He wrote the preceding article during a recent MOBDES assignment at the U.S. Army Belvoir RDE Center, Fort Belvoir, VA.

Belvoir Seeks Safer Paints

There's an old Army joke that goes, "If it moves, salute it. If it stands still, paint it.'' The question in 1987 for the armed services is "with what?" This year is the deadline for implementation of the Clean Air Act. The act requires each state to develop a plan to meet national standards for air pollution control. Pollutants covered by the act include suspended particulates, sulfur dioxide, carbon monoxide, nitrogen oxide, photochemical oxidants and volatile organic compounds—substances commonly given off during painting operations. Failure to comply with Clean Air Act standards for these substances could mean fines or shut downs at many installations where Army equipment is painted.

The Troop Support Command's Belvoir RDE Center is working to make sure that doesn't happen. Its Materials, Fuels and Lubricants Laboratory is making an all-out effort to reduce redundant, outdated and non-compliant specifications for paints and coatings, and to reformulate new products that will comply with Environmental Protection Agency (EPA) requirements.

At the direction of then MG Robert Moore, chief of staff, Army Materiel Command (AMC), the center began its work in 1977. At that time, many of the Army's coatings were found to have a higher level of pollutants than the new EPA standards would allow. Studies showed that there were four alternatives to solve this problem: look to industry to develop coatings that meet EPA restrictions, seek waivers of compliance dates and restrictions, build new facilities to capture and destroy pollutants, or reformulate the coatings to comply with the new regulations.

Reformulation was judged to be the most practical, economical solution. Milestones for this effort were reviewed and approved by MG Moore.

Based on these studies, the center began to develop new formulations to reduce pollutants in Army paints and coatings. This was tied in with another effort to develop new camouflage paints that would be resistant to chemical agents. These paints are now being used in the Army's new three-color camouflage, which is being applied to all tactical vehicles.

In February 1986, the secretary of defense tasked the Army to lead a working group on air pollution control of volatile organic compounds. This group identified the need for a team to review all specifications for paints, dopes, varnishes and related products. As the lead agency for the Army, AMC selected the center to chair the team. Its duties included reviewing all documents for these products to identify specifications that present potential problems, establishing the pollutant content of the coatings, categorizing them by type, and determining which documents could be cancelled.

Following the initial review, the team would identify deficiencies in the remaining documents, develop a list of potential substitutes, separate coatings that could not be controlled in the near term, determine R&D requirements, and report its recommendations to the assistant secretary of defense for acquisition and logistics. Here are some of its findings:

Because pollution control regulations are not uniform across the United States, a critical part of this effort was to select the criteria against which these documents would be evaluated.

Since California has the strictest controls, the center recommended that its local district standards be evaluated to come up with a single set of specifications which would meet requirements nationwide. Using these standards, all the armed forces could identify specifications that had to be changed and sites that were in danger of being fined or closed down for failure to comply. They could then take steps to develop a plan of action to correct the problem.

Once the problem has been defined, the agencies can prepare a schedule for reformulating the specifications. The documents would be grouped according to priority based on useage rate, criticality, and probability of successful reformulation. Among the technical areas investigated would be new, fast drying resins and binders with good solvent release, better solvents for these resins, photochemically exempt solvents, new low volatile organic compounds application systems such as electrostatic powder, and reformulating alkyd base and epoxy polyamide paints.

Under the proposed plan, DOD would support and approve these activities through a working group made up of representatives from the services involved. Participation by the General Services Administration, the Department of Transportation, the Environmental Protection Agency and private industry will also be necessary to establish priorities, insure the new formulas conform to regulations, and to assist with the work required for the reformulation process.

This plan is currently being reviewed by DOD for implementation this year.

The center's efforts have resulted in the reformulation of 70 percent of the Army's paints and coatings to meet EPA standards and the elimination of more that 20 obsolete documents from the Army's list of problem specifications.

ALBE Program Supports Army Field Systems

By Celine M. Childs

Introduction

Knowledge of the battlefield environment becomes more significant when viewed in the context of countering a larger force that can be expected to move rapidly in adverse weather, take advantage of terrain, use smoke during movements, and field weapon systems that have a range and effectiveness surpassing anything seen in the past.

The Army's response to this threat is outlined in AirLand Battle Doctrine, the Army 21 Concept and the FOCUS 21 Concept. To fight and win the AirLand Battle, the Army must field a combat force that can move quickly and effectively against the enemy. The agility of this force will depend in part on the availability of up-to-date information; information not only about the enemy, but about the terrain and weather, and their synergistic effects.

Historically, commanders have had only limited access to environmental information during the planning process. The manual methods used to acquire and analyze such information precluded the generation of decision aids with the speed needed to support continuous operations. The needed support can be achieved by the use of advanced technology systems.

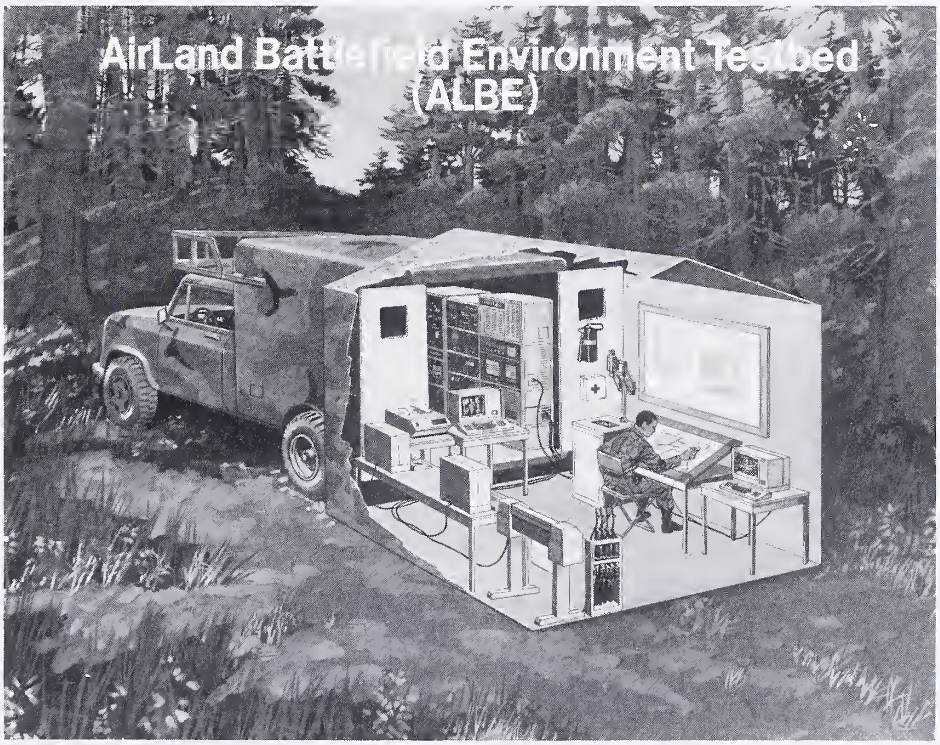
The planned development and fielding of systems like the Maneuver Control System, the All-Source Analysis System, the Digital Topographic Support System and the Integrated Meteorological System will provide commanders with the capability to acquire, process, assimilate and disseminate intelligence, terrain and environmental information in an efficient and timely manner. However, new capabilities are needed to insure that the combined effects of the battlefield environment are assessed and exploited for maximum tactical advantage. The U.S. Army Corps of Engineers has instituted the AirLand Battlefield Environment (ALBE) initiative to focus these activities.

ALBE

The Corps of Engineers initiated and is managing the ALBE demonstration and evaluation program to coordinate Army technology base efforts in the environmental sciences. The Intelligence School at Fort Huachuca, AZ, is the Training and Doctrine Command's proponent for ALBE. ALBE will ensure that products developed from these efforts exploit battlefield environmental effects as a force multiplier in combat operations.

The Corps' laboratories, the U.S. Army Engineer Topographic Laboratories (USAETL), U.S. Army Construction Engineering Research Laboratory, U.S. Army Cold Regions Research and Engineering Laboratory, and U.S. Army Waterways Experiment Station along with the Army Materiel Command's Atmospheric Sciences Laboratory are working cooperatively to support the ALBE Program which will be implemented in several stages. These include assembling an ALBE test bed, installing tactical decision aid software, conducting field demonstrations and evaluations, and ultimately transferring the software to several target systems that are scheduled for fielding in the near future.

An important first step in implementing the ALBE demonstration program was the Terrain Analyst Work Station (TAWS), the 6.2 tech base version of the ALBE test bed. This terrain analysis demonstrator was used to refine automated techniques for digitizing, analyzing and using topographic data for eventual integration with the Digital Topographic Support System. USAETL scientists incorporated the most up-to-



The AirLand Battlefield Environment testbed gives commanders and terrain teams tactical advantage.

Scientists demonstrate the prototype equipment inside the TAWS van used in a recent ALBE demonstration.

date microcomputer technology, analytical photogrammetry, computer-assisted photo interpretation and geo-based information processing into the design of TAWS.

To date, TAWS has been demonstrated at five sites. These demonstrations provided an opportunity for terrain analysts to become familiar with computer operations, and automated terrain analysis capabilities and techniques.

The system was first introduced in October 1985 to terrain analysts at the 1st Armored Division Headquarters in Ansbach, West Germany. At that time, TAWS was demonstrated in its non-tactical laboratory system configuration. The system also was demonstrated at the XVIII Airborne Corps, Fort Bragg, NC, and at the 29th Engineer Battalion (Topographic) at Fort Shafter, HI. Following these demonstrations, the equipment was shock-mounted and placed in a self-supporting van to simulate a system functioning in a field environment.

In its tactical shelter, TAWS has been successfully tested and demonstrated to soldiers of the 537th Engineer Detachment (Terrain), Headquarters, 9th Infantry Division at Fort Lewis, WA, as a featured part of the ALBE demonstration. The most recent ALBE demonstration using TAWS was held in conjunction with the Team Spirit '87 field training exercise in Seoul, Korea. In this demonstration, products were produced and used on site. Soldiers and scientists who participated in the 10-day exercise prepared more than 400 intervisibility and terrain analysis products for 15 customers.

Another milestone in implementing the ALBE demonstration program includes the ALBE test bed (ATB) which is being designed for maximum flexibility in both hardware and system software architectures. The ATB will serve as a vehicle that can operate in field demonstrations. Field demonstrations will be conducted to gather data and develop methodologies that will facilitate the transition of ALBE software and products to target field systems.

Tactical Decision Aids

The ATB will use two ruggedized central processing units with a virtual memory operating system that will support production of weather and terrain related tactical decision aids (TDAs). TDAs are digitally produced software products that can show the effects of the environment on equipment, weapon systems and battlefield operations. The central processing units will be housed in individual integrated command post shelters that can be mounted on commercial utility cargo vehicles for transportation to ALBE demonstration sites. The units will be able to communicate with each other and with related computer systems and sensors.

Each Central Processing Unit (CPU) has a unique function. The first CPU is a weather-intensive processor that is used to collect, process and store meteorological and related data needed to generate weather-intensive TDAs. The second CPU is a terrain-intensive processor that is used to create, update, revise and intensify digital terrain data as well as to generate terrain-intensive TDA products. This processor will also contain hardware for digitizing hard-copy products that can be used as background maps. This dual CPU setup will assure that weather and terrain data are adequately collected, processed and stored while simultaneously generating TDA products.

The major objectives of the ALBE program are to demonstrate, test and evaluate these TDA products as well as TDA software. Since TDAs show current and predicted environmental effects, simulations of tactical situations can be created to help effectively plan battle operations. For example, they can be used to evaluate weapon system performance, determine the advantage of one system over another and anticipate how operations will improve or deteriorate.

There are six TDA categories: Army Aviation; Countermobility; Ground Mobility; Nuclear, Biological and Chemical; Weapon System Performance; and Terrain and Atmospheric Utilities.

Army Aviation TDAs will demonstrate the application of terrain atmospheric models in analyzing air craft performance, producing screen graphic plots and textual reports.

Countermobility TDAs evaluate the effectiveness of obstacle deployment considering the state of the environment, troops and equipment, and time constraints. Obstacles addressed include: minefields, wire barriers, craters, rubble, ditches, log obstacles and flood zones. The products developed allow evaluation of alternative plans and reduce the time required to implement an obstacle strategy.

Ground mobility TDAs provide a comprehensive description of vehicle capabilities on roads and off roads. Graphic displays will describe the ability of vehicles and convoys to transport troops and materiel across any type of terrain, in any weather condition.

Nuclear, Biological and Chemical (NBC) TDAs provide information on location, extent and persistence of NBC hazards and smoke; the benefits of using chemical protective clothing; and operations for decontamination.

Weapon Systems Performance TDAs consider environmental effects on electro-optical, seismic and acoustic sensor systems.

The sixth TDA category, Terrain and Atmospheric Utilities, provides general supporting utilities which are used as input by others or as stand-alone products. Either graphics or text products can be used to illustrate critical, environmental effects on military operations.

Digital Support System

The ALBE program plans are to implement its TDA software and products on fielded Army systems expediently. Since the majority of ALBE software is somewhat specialized, and requires extensive terrain and environmental data in addition to significant computational capability, only selective systems will accommodate the software. The U.S. Army Engineer Topographic Laboratories' Digital Topographic Support System (DTSS) is such a system. ALBE will have hardware and software architectures compatible with DTSS. While only one of several target systems, the DTSS will probably field more ALBE test bed capabilities than any other system and will likely be a primary generator and consumer of ALBE products.

The DTSS, scheduled to reach the field in 1991, will automate much of the labor-intensive work involved in terrain analysis. The digital terrain data base used with the DTSS will replace hard-copy overlays; its hardware and software will replace slide rules and calculators, thereby adding two new characteristics to the analytic process—speed and flexibility.

USAETL scientists and engineers have already developed most of the software needed to make DTSS an invaluable terrain analysis tool. Once DTSS is fielded, terrain teams will have more than 20 unique terrain analysis software programs at their disposal. These programs address two tactically important categories, intervisibility and mobility.

Intervisibility programs determine what an observer or sensor can see. These programs work with elevation values and vegetation heights, and compensate for the curvature of the earth and atmospheric refraction. They rely primarily on terrain elevation data, but vegetation heights also can be added. Intervisibility models include a variety of software capabilities.

The other tactically important DTSS category, mobility programs, relies on digital feature analysis data to evaluate the effects of terrain on friendly and enemy operations. Like intervisibility programs, mobility programs will offer many software capabilities to terrain analysts at division and corps level.

Although these software programs offer commanders and terrain teams increased automated capabilities, they require continual revision since terrain data must reflect real-time conditions. ALBE will meet this need by implementing its TDA software and products on fielded Army systems such as the DTSS. It will also give commanders increased access to environmental information for the planning process and ultimately, a better knowledge of the battlefield.

Summary

In summary, the Corps of Engineers has created an innovative approach to transfer technology, vitally needed by the commander, from their tech base to the field. The fielding strategy does not require the funding and development that is required for a new system. Instead, it will use planned and existing systems to field essential capabilities. An interim step is a series of well-planned demonstrations, appraisals and evaluations with field units that will verify the effectiveness of the technology as a force multiplier. Implementing this innovative approach in a time of budget constraints will result in a relatively low-cost way of getting vitally needed capabilities into the field.

CELINE M. CHILDS is a public affairs specialist at the U.S. Army Engineer Topographic Laboratories, Fort Belvoir, VA. She is a graduate of Lock Haven University and has a bachelor's degree in liberal arts English.

Army Patents Lead to Commercial Welding Monitor

National Standard, Inc., of Niles, MI, has begun marketing ARCHON II—an arc welding process control system developed by the firm from an invention by Frank Kearney of the U.S. Army Construction Engineering Research Laboratory (CERL).

Exclusive rights to three patents from the CERL weld quality monitor were awarded by the Army to National Standard in May 1984. "National Standard did an excellent job in developing and expanding upon our initial concept for what we called the Weld Quality Monitor," says COL Norman C. Hintz, commander and director of CERL.

Through a variety of sensors, the ARCHON II helps manage the arc welding process by monitoring and comparing key welding parameters against preset limits. Microcomputer software also has been developed by National Standard to support the ARCHON II. "Archon II and the programs assist management in analyzing the process behavior, evaluating the efficiency of the welding process, and reviewing material and welding equipment selection," says Steve Habib, ARCHON II product manager.

The transfer of the patents was made possible under the authority of the Stevenson-Wydler Technology Innovation Act of 1980. This act encourages the transfer of technology from federal laboratories to state and municipal agencies and private industry. The act and recent revisions to it allow federal laboratories to enter into joint agreements for the purpose of further developing and marketing its technology. "Without this interaction between the Army research community and industry, not even the Army can benefit from its own research investment," says COL Hintz.

Under the exclusive licensing agreement, the licensee obtains sole use to the patents owned by the government. The federal government in turn receives a five percent royalty from sales of products developed from the patents.

Advertising and marketing brochures announcing the availability of the ARCHON II Arc Welding Process Control System were released by National Standard in October 1986. National Standard introduced the ARCHON II to the commercial welding industry at a press conference on March 25, 1987, during the American Welding Society annual meeting and show in Chicago. The price of the ARCHON II system ranges from $8,000 to $25,000 depending upon the options selected.

An Experiment in Optical Filtering

By CPT Steven S. Cotariu,
Dr. Gareth T. Williams
and Christina Brown

Introduction

One form of a radar signal identification system presently being developed for use in military vehicles involves real-time optical information processing. Such systems employ optical and electro-optical components which need to be carefully designed, fabricated, and assembled to occupy as little space as possible. However, as a result of this miniaturization, diffraction effects can become important, giving rise to significant noise in the output of such a system.

A typical optical system consists of a laser, the beam of which is enlarged and then passed through a Bragg cell. At the same time, acoustic waves, which are made to follow the frequencies of any incoming electrical signals, are sent into the cell. The Bragg cell is a crystalline material which exhibits acousto-optic characteristics.

The effect of sending an acoustic wave into an optical medium such as this, is to cause the refractive index to vary periodically along the wave propagation direction, with a periodicity directly related to the frequency of the incoming signal. Under these conditions, the Bragg cell acts like a grating made up of planes, which diffract significant amounts of light at an angle that is proportional to the frequency of the incoming wave.

If many signals are sent into the system, all at different frequencies, each will give rise to a beam of light emerging at a related angle. These frequencies can therefore be determined by detecting where the beams strike a viewing screen, and measuring the distance from these positions to the position of the undeflected beam.

However, because of the diffraction effects associated with miniaturization, each spot of light has associated with it secondary maxima surrounding the central maximum, so that if the strengths of the input signals are significantly different then a weaker signal could be mistaken for a secondary maximum.

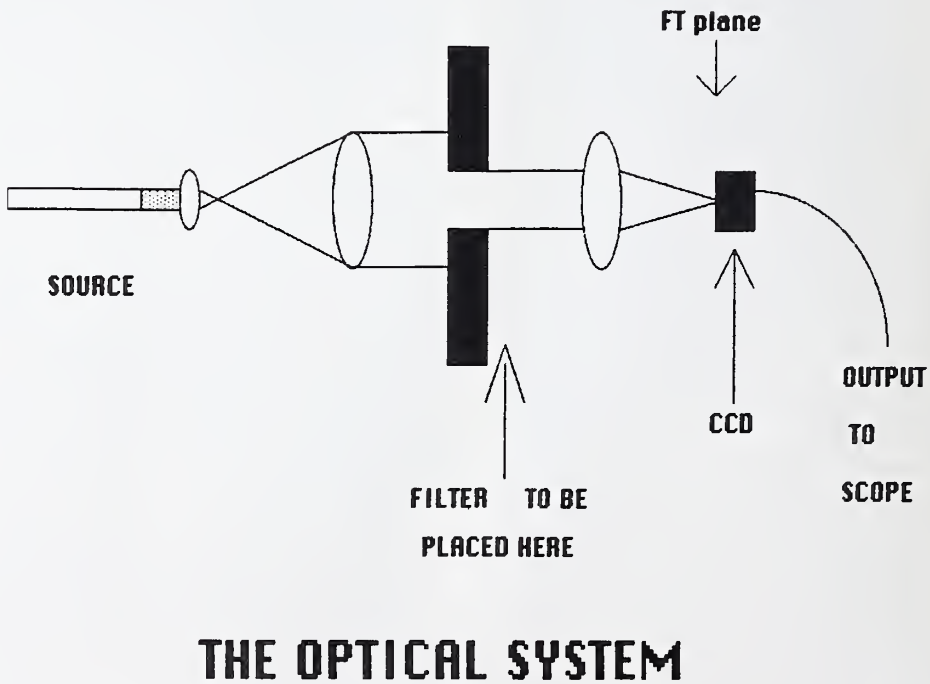
These diffraction effects were investigated, and significantly reduced, by the authors in the Physics Department at San Jose State University using a standard optical filtering approach, but employing a novel technique for producing the filters.

Optical System Set Up

The optical system used to perform the experiment was a typical Fourier optics spectrum analyzing system, consisting of a Helium Neon laser as the source, a beam expander, an aperture, and a lens. A charge-coupled device and an oscilloscope were used to read the output of the system.

The beam expander was used to increase the beam into a workable size to completely illuminate the aperture. The first lens was used to collimate the beam, or create plane wave fronts, and the aperture was used to simulate the diffraction effects caused by placing a small Bragg cell between the two lenses. Such effects occur when the extent of a beam is limited by the sharp edges of an aperture. The second lens was used to focus the beam into the Fourier transform plane, the output plane of the system.

The charge-coupled device was placed at the Fourier transform plane to scan across the beam and measure its intensity. It was connected to an oscilloscope, enabling close examina-



CCD—Charge-Coupled Device
FT plane—Fourier Transform Plane

tion of the beam profile. The irradiance profile of the laser beam before the aperture was Gaussian, and the aperture acted as a single pulse, thus truncating the Gaussian curve. The resultant irradiance distribution in the Fourier transform plane was close to that of a single slit diffraction pattern, as expected.

Filter

Suppression of the side lobes, observed in the single slit diffraction pattern, can be accomplished by covering the aperture with, say a suitably coated flat glass plate. If the coating becomes increasingly more opaque as it goes out from the center then the transmitted field will correspondingly decrease until it is made to become negligible at the edges of the aperture.

In particular, if this drop-off in amplitude follows a Gaussian curve, then in the Fourier transform plane, the resultant irradiance will also be Gaussian. With this process, the central peak is broadened; however, the side lobes are indeed suppressed. In optics this process is known as "apodization."

To do this in the form of a filter, the Gaussian distribution was created on paper, using black as the minimum density and white as the maximum. A photograph was then taken of the density distribution and its negative used as the actual filter.

The Gaussian density distribution was approximated using a series of computer generated step functions of various densities. A set of these computer printouts were arranged on a 152cm by 19cm board to enable clear photographs to be taken. Since the Gaussian distribution had been approximated by the step functions, photographs were purposely taken in varying degrees of focus, in the hope that additional diffraction effects would not occur as the density changed within the filter.

Results

After placing the filters in the system, a reduction of side lobes was observed. Through visual inspection of the oscilloscope output, the filter that produced the largest reduction was determined to be the one that was most out of focus.

The actual distribution of this filter was then evaluated to determine how closely it followed a Gaussian distribution. This was done by scanning the slide with a fiber optic source and recording the transmission of intensity as a function of distance. The outcome, although not perfect, was a smooth Gaussian type distribution.

Conclusions

It was evident from this experiment that apodization through the use of a filter is not only possible, but also very successful in the reduction of side lobes. As in any engineering design, compromises must be made. In this case, the reduction of the side lobes is achieved at the expense of needing more bandwidth due to the broadening of the central maximum.

It was also evident that a filter of this type can be made to follow a Gaussian distribution through the simple method of defocussing a step function of various densities.

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CHRISTINA BROWN is an associate engineer in the Astronautics Division of Lockheed Missile and Space Corp. She holds a B.S. degree in electrical engineering from San Jose State University.

AATD Develops New Training Aids

The U.S. Army Aviation Research and Technology Activity's Aviation Applied Technology Directorate, Fort Eustis, VA, is ballistically damaging non-serviceable helicopters to provide realistic training aids for the Aircraft Combat Maintenance/Battle Damage Repair (ACM/BDR) system.

These training aids will support the U.S. Army Aviation Logistics School's ACM/BDR damage assessor training program. The Aviation Logistics School provided an AH–1S Cobra and a UH–60A prototype aircraft for the training aids. Future plans include an OH–58D and an AH–64A Apache.

The requirement for an ACM/BDR system is the result of the 1982 Army aviation mission area analysis findings that aviation units would be flying at a substantially higher rate during combat than at peacetime. This would create a maintenance workload that will rapidly overwhelm the maintenance units and deplete their spares inventories which are geared toward peacetime maintenance.

This system consists of kits and manuals which will be used during combat to provide expedient damage repair tools, parts and procedures. "BDR kits to repair damaged aircraft wiring, fluid lines, and fuel cells have been developed," explained Ming-leung Lau, AATD project engineer. "In addition, BDR manuals for the AH–1S, UH–1H, OH–58, UH–60A, and the AH–64A helicopters containing damage assessment and repair criteria and procedures have been, or are being developed."

The development of this system is a joint effort of the Aviation Applied Technology Directorate, the materiel developer, and the Aviation Logistics School, the combat developer. Fielding of the system is scheduled to begin in FY87.

Improved Detection of Rocket Vapor Leaks

By Bill Thomas

Creative people say that necessity is the mother of invention. If this is true then Frank Unrein can lay claim to being one of the most creative people at Umatilla Depot Activity. Unrein, an activity employee for the past six years, has developed a more efficient procedure for detecting chemical vapor leaks in the obsolete M55 rockets stored at the depot.

According to Unrein, his motivation for developing the new procedure came in 1985 when the activity was instructed by the U.S. Army to closely monitor the rockets for vapor leakage in their storage container. The program, termed the Enhanced Storage Monitoring System (ESMS), called for the installation to inspect more than 1,700 rockets each quarter.

Since the program began in 1985 more than 12,000 M55 rockets have been inspected under the ESMS. Under the close scrutiny of ammunition inspectors, agent vapor has been detected in only nine rocket storage containers, said Steve Penrod, chief, Quality Assurance Division.

Under the Enhanced Storage Monitoring System, two ammunition inspectors extract air samples from the rocket's storage cylinder (shipping and firing tube). The air in each rocket is sampled for 15 minutes. Air is drawn through the storage container, through tubes into a glass vial filled with a chemical solution, which collects agent vapors. The liquid filled vials are then taken to the activity's chemical laboratory where the air samples are analyzed for the presence of agent vapor in the liquid-filled vials.

If a "leaker," as a defective rocket is called, is detected, the rocket in its container is encased in another metal storage container called a leaker container. These containers are then stored with other detected leakers. They are then monitored on a daily basis to ensure the leaker container is intact and the agent vapor is not contaminating the air inside the locked storage magazine, commonly called an "igloo."

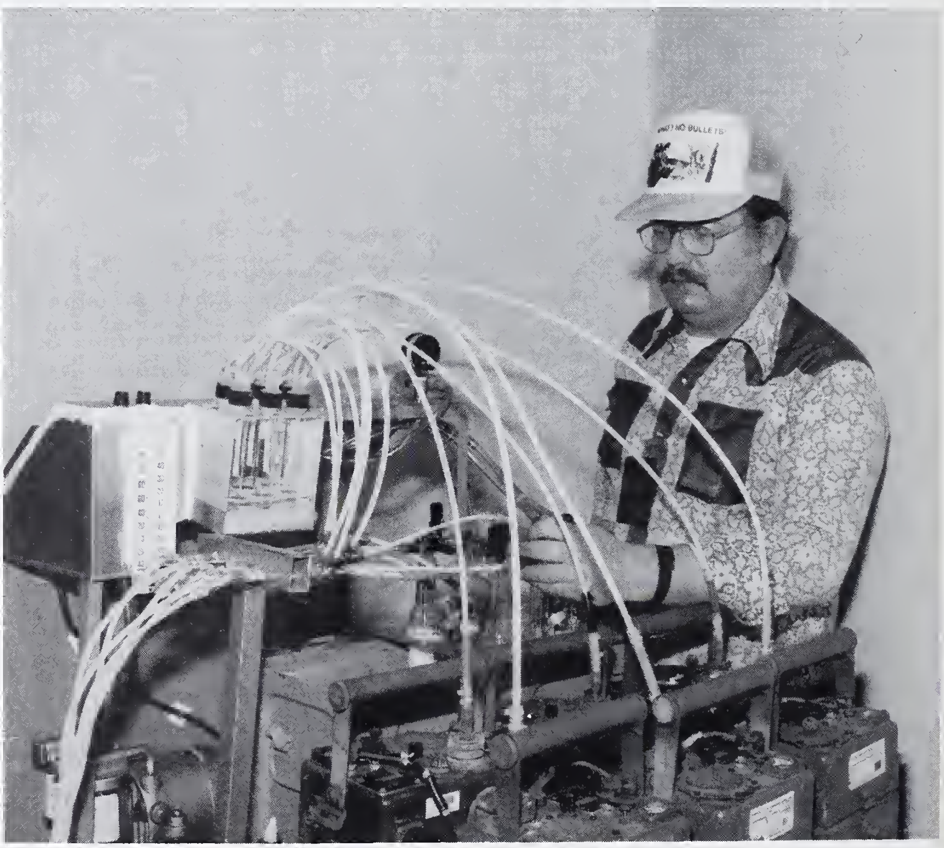
Prior to the ESMS, M55 rockets in the Army inventory were monitored on a random basis once each year. Through this inspection, leakers were discovered in the inventory and the Army ordered that all of the obsolete M55 rockets be monitored on a quarterly basis to ensure the rockets were not deteriorating to an unacceptable level, Penrod said.

According to Penrod, 217 M55 rockets had the agent drained from them at Umatilla with the Drill and Transfer System, which was completed in September 1985.

"When we received word that we were to perform this quarterly testing of all our M55s (rockets), I knew that the system that we currently used for normal rocket monitoring would take a great deal of time and manpower," remarked Unrein, a chemical equipment mechanic. "I just knew that there had to be a more cost-efficient way to do it."

Unrein explained that the normal procedure in monitoring chemical munitions was for ammunition inspectors to use four separate individual pieces of equipment for each rocket being tested. "It takes a lot of time and effort to safely test these rockets," he stressed.

"For testing an individual rocket, inspectors must use a sequential sampler (vacuum pump), an M-8 chemical agent



Frank Unrein, chemical equipment mechanic, looks over his air monitoring system for M55 rockets.

alarm, air line (tubing), and an ice bucket, to control the air sample temperature. Knowing the number of rockets we had to test started my mind working for a better procedure," Unrein said.

The Oregon native evaluated the situation facing the activity and its inspectors and developed the system presently being used.

Unrein's multiple testing system, affectionately called the "Octopus" by those using the system, is designed to test and monitor six rockets at one time.

"The Octopus we are using now is actually the third modification of my original idea," Unrein said. "I keep upgrading the system to allow for ease of mobility and operation."

The first generation system was both bulky and cumbersome, Unrein said. Mounted on a large laboratory cart, the Octopus had six M–8 chemical agent alarms, six M–10 power supplies, six M–42 remote alarms, a manual timer, a vacuum gauge, three vacuum pumps and tubing. "It was a monster," he said. "It was heavy and the inspectors had a hard time moving it to the igloos. As I said, it was my first idea. It proved functional and it worked. The inspectors were able to safely test six rockets at one time with a single piece of equipment."

Since the first Octopus was put into use in April 1985, he has twice changed his design, making it more reliable and lighter. The latest system now has only one vacuum pump and a single power supply. He has added a water trap that eliminates the chance of moisture from the air sampling procedure from damaging the M–8 chemical agent alarms. He has also replaced the six remote alarms with an eye-level panel of six signal lights. In addition, the latest version has an electric timer to more accurately let the inspectors know when the required sampling time has expired.

According to Unrein, his multiple testing system mounted on a transportable cart is easy to use. The tubing and corresponding systems are color-coded to show which rocket is being monitored.

"In all, I think the Octopus is a good piece of equipment. It helps the inspectors and reduces the amount of time needed to support the Army's requirement to test and monitor the rockets in storage," Unrein declared.

"I'm always trying to make the monitoring equipment user-friendly without sacrificing safety. I hope to keep updating the Octopus with state-of-the-art equipment," he said.

Unrein's penchant for improving operations at the activity has not stopped with the air monitoring system. He also designed and built a trailer which makes it easier to transport his system. The trailer, he said, saves time and manpower. Two people can easily load the cart on the trailer, hook it to a vehicle and take it to the igloo where the rockets are being monitored.

According to Penrod, Unrein's air monitoring system will save the U.S. Army more than $49,000 each year in manpower costs at Umatilla.

BILL THOMAS is the public affairs officer at Umatilla Depot Activity, Hermiston, OR.

Army Approves Plans for Rotorcraft Transmission Technology

The Army's Aviation Systems Command's Aviation Research and Technology Activity (ARTA) has announced that Dr. Jay R. Sculley, assistant secretary of the Army for research, development, and acquisition, has approved plans to conduct a 72-month advanced rotorcraft transmission program. ARTA also announced that initial contracts will be let by the end of this fiscal year.

The Army is taking this opportunity to combine component advances into a full-scale technology demonstrator. The program provides lead time required for basic integration prior to committing to overall development of future systems.

The intention is to devote enough upfront R&D effort to establish confidence in innovative designs, thereby permitting incorporation of key emerging material and component technologies. Targets of opportunity will be future cargo and attack rotorcraft systems. Compared to today's systems, the plan is an aggressive and ambitious one, aimed at:

- reducing drive-system weight by 25 percent,
- reducing source noise by 10 decibels, and
- increasing mean time between removals up to 5,000 hours.

This Advanced Rotorcraft Transmission Program is part of the Army Propulsion 21 Technology Demonstration which is one of the Army top 20 technology demonstrations. This will be the first advanced development effort to be pursued by ARTA's Propulsion Directorate, collocated with NASA at the Lewis Research Center in Cleveland, OH.

The Propulsion Directorate, along with NASA-Lewis and industry, has been involved in advancing component technologies in a wide array of disciplines consistent with improving the performance, reliability and effectiveness of future rotorcraft systems.

The Army expects that offerors will propose innovative arrangements, using results from recent research and exploratory developments for mechanical components. The approved plan is divided into three phases of work, as follows:

- In phase one, four contractors will evolve preliminary designs of advanced transmissions, establish component requirements, quantify gains, and deliver a report and plan for the balance of the program.
- In phase two, the same four contractors will conduct advanced component R&D efforts for configurations offered in phase one, including design, analysis, fabrication, and test. It is expected that subcontractors, will be involved with the primes.
- In phase three, based on progress and potential for reaching the targets, it is likely that a down-select to two contractors will take place prior to proceeding with a full-scale demonstration of the proposed transmissions, sized for the expected future cargo and attack rotorcraft which are currently in concept definition.

Lightening the Force...

Army Materials Lab Works With Small Business

The U.S. Army Materials Technology Laboratory (MTL), Watertown, MA, is reducing weight, as well as operation, maintenance and logistics costs, while enhancing mobility and efficiency. Working in concert with small business, through the Small Business Innovation Research (SBIR) Program, MTL is helping to stimulate and encourage scientific and technological innovation in the private sector through high quality research and development on Department of Defense (DOD) interests.

Mandated by Public Law (P.L. 97–219), the federal SBIR Program also serves to strengthen the role of small business in meeting DOD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DOD-supported research or research and development results.

Lightening the force has been a management and technical thrust of MTL for a number of years. MTL's basic emphasis has been to develop and demonstrate structural materials for high performance applications of Army interest.

The most significant of these applications includes the Composite Turret and Composite Infantry Fighting Vehicle (CIFV) demonstration programs. The CIFV hull was recently included in the "Top 20" list of high priority Army demonstration projects. These efforts demonstrate the advantages of using composite structural armor in place of aluminum in medium weight combat vehicles.

Composites will be considered in the design of the Army's Armored Family of Vehicles (AFV) being coordinated by the AFV Task Force, Fort Eustis, VA. Other important composite applications include the Army's Lightweight Howitzer Program being coordinated with the Army Armament Research, Development and Engineering Center, Dover, NJ.

In 1982, Congress passed the SBIR Act establishing a three-phase program. Phase I and II are federally funded to demonstrate the scientific or technical merit and feasibility of a concept and to continue with a principal research and development effort. Phase III is intended to be funded by non-federal capital for small businesses to pursue commercial application of their research and development activities. Government agencies may also procure products or processes developed under the SBIR Program with non-SBIR funding.

"We are wholly in support of the SBIR Program because both the Army and other DOD components as well as small business benefit," says Dr. Edward Wright, MTL's director. "We have found that this program is a productive and very cost effective avenue toward getting novel ideas evaluated, prioritized and pursued."

U.S. Composites of Troy, NY, is the first small business to be awarded a contract by MTL under the SBIR Program and is now approaching the end of Phase II. The focus of the company's efforts has been to exploit a resin applicator ring to continuously impregnate moving fibers with resin in a controlled environment for effective braiding of composites. This concept was conceived by U.S. Composites President August Hugo Kruesi who has received U.S. and international patents on his unique process.

"Private industry is reluctant to invest in an idea from a small entrepreneur without first seeing a demonstration article," says Kruesi. "The SBIR Program solved this problem by allowing us to make an effective demonstration. With the Phase II support provided by the U.S. Army Materials Technology Laboratory, we have built a production scale resin applicator ring for composite braiding..."

Tubular specimens of fiberglass composites were prepared and tested to compare resin applicator ring versus conventional braiding. Properties for the resin applicator ring braided specimens were 24 percent greater in torsional strength and 29 percent greater in torsional modules than conventional braided specimens.

Potential structural applications for braided composites are vast within the Army and include helicopter and propellor blades, launch tubes and lightweight bridging components. The potential advantages of effective manufacture of composite parts via braiding include high production rates, precise fiber orientation, net shape fabrication, superior damage tolerance and cost savings of up to 40 percent along with quality improvements.

The E.I. DuPont De Nemours and Co., Wilmington, DE, has committed itself to provide some Phase III funding to U.S. Composites to pursue commercial applications of the achievement. "A licensing agreement with DuPont's newly formed Composites Division combines the strengths of both companies in this effort," says DuPont Segment Manager Don Linsenmann.

The first Army components fabricated to demonstrate the resin applicator were sub-scale trails for the lightweight howitzer. These were manufactured during October 1986 on a composite braider located at Watervliet Arsenal's Benet Weapons Laboratory, Watervliet, NY. The Army will retain possession of the full-scale production resin applicator ring that has been installed on the 144 carrier braider at Watervliet Arsenal's Composites Laboratory.

A dual "End-of-Project-Demonstration" will take place at Watervliet Arsenal this summer. One demonstration item is Watervliet's 144 carrier braider which was developed under the Manufacturing Methods and Technology program. The other item being demonstrated is the "Resin Applicator Ring" developed under the SBIR program by U.S. Composites.

"We are very pleased with the results of this SBIR program," says Thomas O'Brien of Benet Weapons Laboratory's Advanced Technical Section. "It has provided us with an innovative solution to a major limitation in the manufacture of braided composite components, that of applying the precise amount of resin to the part. We feel that the resin applicator system will be a great step forward in the manufacture of composite components. The success of this project, resulting from the cooperative efforts of MTL, Benet Weapons Laboratory and U.S. Composites, effectively demonstrates the viability of the SBIR Program."

"This cooperation between MTL, Watervliet Arsenal's Benet Weapons Laboratory and U.S. Composites is an excellent example of how the SBIR Program is supposed to work. It has resulted in significant gains all the way around," says MTL's technical monitor of the contract Noel Tessier.

Career Development Update

New Staff College Trains Army Civilian Managers

Army civilian managers will soon be able to attend a staff college specifically designed to meet their training needs. The Army Management Staff College (AMSC) is being established to provide comprehensive, Army-specific training that has not been readily available to large numbers of civilians. The new school will also train some military officers who are slated for future assignments in which they will work closely with Army civilians.

The AMSC curriculum will be geared toward mid-level managers and officers entering or serving in jobs in materiel management, resource management, personnel management and equal employment opportunity, installation management, and other areas involved with supporting the Army in the field.

Major commands will select managers at the GS/GM–12 to 14 level to attend the AMSC. The U.S. Army Military Personnel Center will select officer attendees from among majors and lieutenant colonels who have graduated from the Command and General Staff College.

The 19-week course will provide training in management systems, leadership, and military doctrine and will include a major writing exercise and a corporate fitness program. The course is designed to sharpen students' management and leadership skills. It will also provide students with a broad perspective on how the Army's organizational elements work together to sustain the Army's ability to fight and win a war. Another objective of the course is to strengthen the bonds between Army civilians and officers.

The Army hopes that the AMSC, by fostering a "big picture" view of the Army for civilian managers, will be an important source of future GM–15s and Senior Executive Service members.

The new staff college will begin full operations by January 1989, training 600 students annually (approximately 260 civilians and 40 military per class, with two classes per year).

The first of two AMSC pilot programs will begin in July of this year. Fifty students (42 civilian, 8 military) have been selected to attend the first pilot course, including 14 from the U.S. Army Materiel Command and its activities.

Civilian attendees for the first pilot course were selected from among employees who applied under the first AMSC announcement. That announcement was distributed through the civilian personnel office channels of certain major commands in December 1986. Individuals interested in attending subsequent AMSC courses should watch for distribution of future AMSC announcements.

The temporary site of the AMSC is the Maritime Institute of Technology and Graduate Studies located in Linthicum, MD (near Baltimore-Washington International Airport). A decision on the permanent location for the new college will be made following completion of a site study by the Training and Doctrine Command.

The AMSC is one of a series of civilian personnel modernization initiatives the Army has undertaken to strengthen civilian training and career development, thus, assuring the availability of future, well-trained civilian executives.

Executive's corner . . .

(Continued from the inside back cover)

Federal Acquisition Regulation and the Defense Federal Acquisition Regulation Supplement. The military departments and Defense Logistics Agency need to review their implementing instructions with an eye towards simplifying the process and moving responsibility and authority to the lowest possible level. The goals are clear. The regulations must be simplified.

There has also been a lot of recent legislation designed to improve the acquisition process. We are working with the Office of Federal Procurement Policy reviewing a number of suggestions for individual changes to existing laws, and will pursue those that we can clearly demonstrate will correct serious problems. However, we expect a much larger pay off from changing regulations, rather than trying to change laws.

Bob Bedell, the administrator of the Office of Federal Procurement Policy, fully supports our regulatory reform goals, and we are working together to make major improvements in the system as rapidly as possible.

Before closing, I would like to emphasize the Defense Department's commitment to small and disadvantaged businesses, which cuts across the five initiatives I just outlined.

The Defense Department is aggressively attempting to achieve its goal of awarding five percent of its contract dollars to small and disadvantaged businesses. We are encouraging prime contractors to also strive toward a five percent goal in their businesses.

Conclusion

In conclusion, our initiatives form an aggressive agenda. The Department of Defense plans to continue its efforts in line with the president's competitiveness program to create an environment that fosters the establishment of a strong U.S. technological and manufacturing base. We will continue to work with industry to streamline our procurement practices. The president has called on industry to become more competitive. The Department of Defense is committed to the same goal for industry and itself. We are already going forward. We need your active support.

Executive's Corner...

Assistant Secretary of Defense (Acquisition and Logistics) Robert B. Costello Discusses...

Initiatives to Improve the Acquisition Process

The following remarks by Assistant Secretary of Defense (Acquisition and Logistics) Robert B. Costello were presented earlier this year at the Atlanta XIII Executive Seminar in Atlanta, GA. His comments, which have been edited slightly for publication, deal with some key DOD objectives to improve the acquisition process.

Introduction

It is a distinct honor and a great pleasure to address members of the acquisition community assembled here in Atlanta. Since I have been in the Pentagon, I have come to realize the complexity and scope of the DOD acquisition system, and from that have developed a tremendous respect and admiration for you and the excellent job you are doing. To those of you from industry, it is clear to me that we are mutually interdependent. A constructive relationship is vital to us both.

In the past year, we have seen the Packard Commission Report, the DOD Reorganization Act of 1986, legislation establishing the Office of the Under Secretary of Defense for Acquisition, and specific provisions concerning profit policy, special tooling and test equipment, technical data rights, and other issues.

There is a great deal of ongoing activity to implement these changes. These are dynamic times in what is inherently a complex and challenging environment. I am excited to be a part of the defense acquisition community, and am anxious to do my best to grapple with the issues facing us.

Over the next day and a half you will be discussing many important issues. As you do, please keep in mind five initiatives that we believe reflect the main thrusts of the Packard Commission Report, recent congressional concerns, and our own assessments.

Improved Relations

● The first initiative deals with improving relations with industry. If we are to have a reliable, effective defense for our nation we must have a vigorous and productive industrial base unencumbered by overly tense relationships between government and business.

Coming from a very competitive industry, I know the pressures on managers to perform in the best interests of the company. However, defense industries must reduce the friction that develops when a commercial enterprise is conducted in full view of the public, as we do. On the government side, we have the obligation to promote stable and uniform policies. We must avoid even the appearance of vindictive or arbitrary behavior.

We know many of the industry concerns, such as an emphasis on punitive enforcement of contract requirements rather than building on a foundation of trust. We also recognize the importance of your views.

This conference provides one opportunity to obtain your inputs. But to ensure we fully understand the current condition of relations between government and industry, we will survey both and use the results to develop recommendations and action plans.

The role and authority of contracting officers are also significant factors in how industry and government relate to each other. We are establishing an interservice group to determine how contracting officers can more effectively function as government's primary representative with industry.

Another vital part of any relationship is communications. We are opening additional lines of communications with industry by putting the Defense Acquisition Review Council on the road at least twice a year and by conducting bimonthly meetings with industry association representatives.

We are looking very hard at the issue of duplicative reviews at both the prime contractor and subcontractor levels and will attempt to consolidate them wherever possible.

We are also taking an in depth look at special tooling and test equipment policies. I know that many of you here have a personal interest in this policy. We have established an interservice group to assess the long-term impact of recent legislation and to ensure this policy's proper and uniform application.

However, industry, which includes many of you here today, must do its part to improve its practices; while those of us in DOD must avoid short-term solutions, which in the long run, could damage the industrial base.

The Work Force

● The next of our initiatives deals with the procurement and logistics work force. The objective here is to increase our effectiveness. Effectiveness means not just doing more of the same with less people, but approaching acquisition tasks differently to get better overall results.

The president has directed a 20 percent productivity improvement, government-wide. A one percent improvement in how we buy would reduce costs by one and a half billion dollars.

We have three specific objectives to accomplish in this area. First, we must ensure we don't duplicate other efforts. Second, we must identify the best programs and areas where no programs exist, but are needed. Your input will be important in this area. Third, and this is where we will depend on you again, we need to follow through and implement the set of programs we determine will give the best results.

I feel the people we have are of high caliber and, in general, are sufficiently educated. Programs are already under way to upgrade education, training, and experience requirements across the board.

I am more concerned about improving the "bottom line." Are we buying and managing things in the smartest way? Can we improve our procurement and logistics process to concentrate less on following rules, and more on "buying smarter" in the market place?

Again, I am concerned about how we communicate. DOD is modernizing its information systems, but in some cases the process is too slow. To buy and manage smarter, communications and data exchange must be more responsive. The technology to do this is here now. We must exploit it now.

Cost of Quality

● Our third objective focuses on the cost of quality. It is aimed at new approaches to acquisition and logistics support planning that will significantly improve the quality of systems and processes, in terms of fitness for use and efficiency.

Our present posture is characterized by a perception of high acquisition costs, long development and production lead times, and large and growing operations and support costs.

Our basic approach to change these perceptions centers on developing new ways of doing business in three important areas: the acquisition process, manufacturing, and operations and support

We are currently studying programs and activities that will significantly improve our quality costs, and are identifying specific systems to which these prototype programs should be applied. During this process, suggestions, support, and participation will be solicited from the military departments and the private sector.

As Deputy Secretary Taft said recently, "Quality means more than just a product that meets minimum standards. In our definition, a quality product is one that not only performs as expected, but meets a broad range of related expectations. These include reliability, maintainability, ease of use, durability, and conformance. We simply cannot afford to acquire systems that do not attain this high standard."

Industrial Base

● Our fourth initiative is concerned with revitalizing the industrial base. A strong, robust industrial base is essential to our national security. Our industrial base serves both as a deterrent to aggression and if that deterrence fails, provides the vast quantities of materiel necessary to fight and win a war. It is our job to see that this base is maintained.

This initiative is in consonance with the president's competitiveness initiative. Its objective is to build a national consensus on solutions to our industrial base problems. The industrial base essential to defense includes the full spectrum of industrial activity in the national economy.

They include defense prime contractors and civilian end product manufacturers convertible to defense production in an emergency; subtier industries such as forgings, castings, ball bearings, machine tools, and semiconductors; basic industries such as steel, petroleum, metals, ceramics, and composite fibers; and essential resources like raw material, energy, capital, technology, skilled manpower, and management.

A critical problem facing the nation is the loss of technological leadership and manufacturing capability and capacity in industries essential to defense, particularly in subtier and basic industries.

The semiconductor industry is highly visible as an essential industry that is in technological and manufacturing trouble; but it is not the only one. Some other essential industries in trouble include bearings, machine tools, and precision optics. Others are likely to emerge.

Solutions will not be easy; however, DOD's R&D and acquisition funding does provide sufficient leverage to help promote national solutions. But the problems ultimately transcend DOD's ability to fix them within our policies, programs, and resources.

For our part, DOD has established a concentrated initiative to deal with manufacturing, industrial base, and competitiveness issues. Our basic goal is to create and articulate a DOD strategy to achieve and sustain U.S. technological and manufacturing leadership essential to the security of the nation.

DOD is taking an advocacy role with the balance of the executive branch and with Congress on technological and manufacturing issues critical to defense.

A management plan is being developed which will identify specific tasks, responsibilities, and milestones. Industry holds the key to its own health; but it must be supported by national incentives and programs to help it compete. DOD must, and will, help create an environment that promotes a strong U.S. technological and manufacturing base essential to national security.

Regulatory Reform

● The last of our initiatives deals with regulatory reform. Our goal is to make it easier and quicker for contracting personnel to get line managers and commanders the quality products and services they need, when they need them, at a reasonable price.

In addition, as the Packard Commission recommended, we want to move toward a system that gives more individual authority to the contracting officer, allowing that person to exercise good judgment and make sound business decisions. We need to rely less on numerous management layers, large staffs, and countless regulations.

There is significant evidence that we aren't using all the authority the regulations and laws already allow. We want to encourage you to use your initiative to obtain the best value for the government, recognizing that value includes quality and timeliness, as well as price. The rules already provide a lot of leeway; unless specifically prohibited from doing something, try new methods and ideas. See if you can improve the process.

We must also establish pilot contracting activities. An important lesson from the model installations program was that relying on the ideas of people who have to deal with the inadequacies and conflicts of the system on a daily basis provides a rapid, effective means of identifying unneeded and constricting rules and laws. We hope to establish a pilot contracting activity program to allow a few contracting offices to serve as test beds, identifying better ways to do business. Some of you will get to participate in this test directly. Once the activities have been designated, the rest of you can help by feeding your ideas to them.

We have been talking to people in the services and in industry to get their ideas on what regulations should be changed. The contract simplification working group has identified problem areas and methods to streamline the

(Continued on page 27)

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